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FLIGHT

INTERNATIONAL

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13-19 OCTOBER 2015

SOUTH KOREA SPECIAL

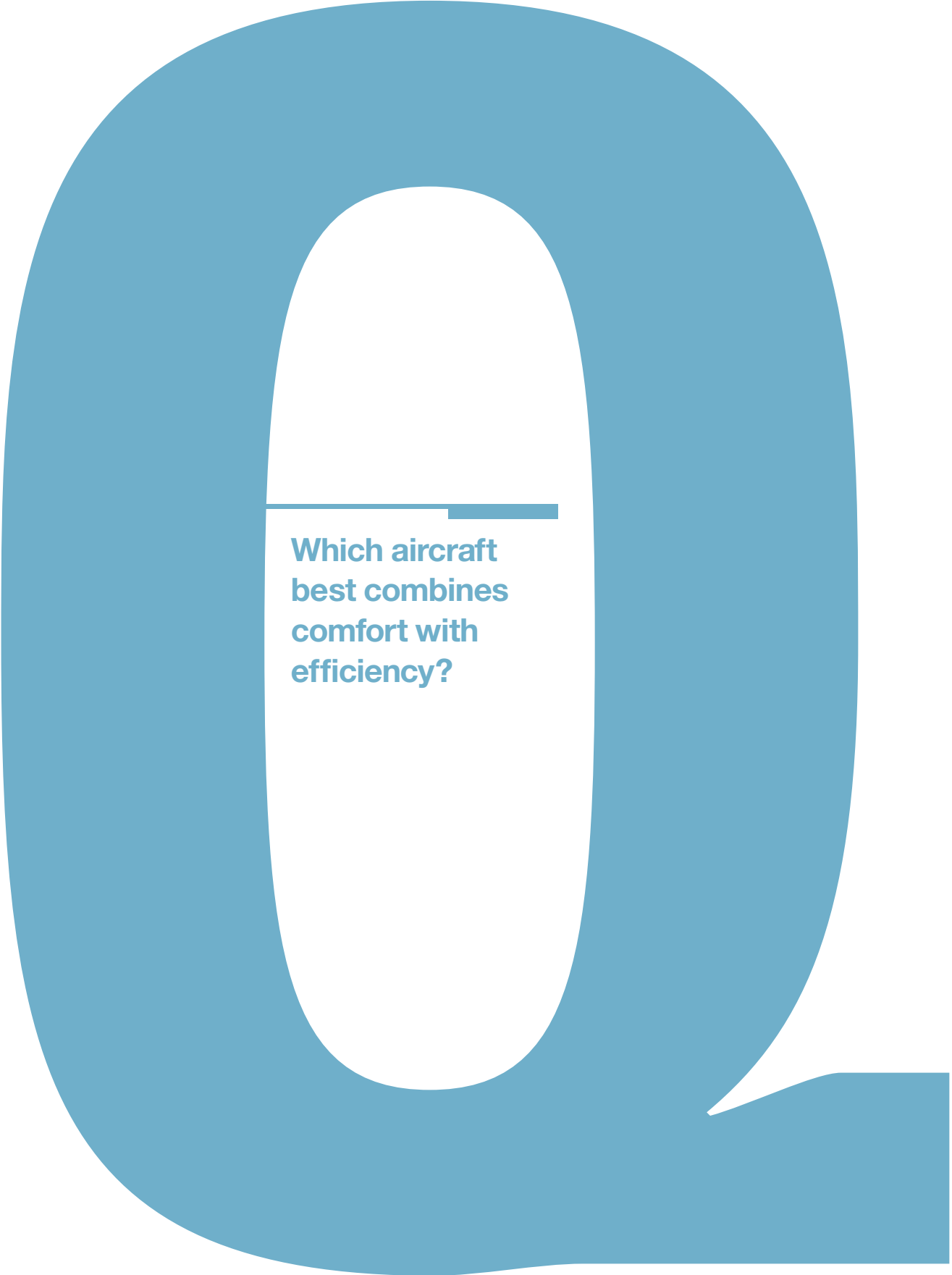
DISPLAYING AMBITION

Seoul aims above T-50 for next
fighter, but USA clips its wings




£3.50





**Which aircraft
best combines
comfort with
efficiency?**

A low-angle, front-facing photograph of an Airbus A350-900 aircraft on a runway. The aircraft is white with a prominent vertical stabilizer. The cockpit windows and wing-mounted engines are visible. The runway and horizon are at the bottom, and the sky is blue with some clouds. The image is framed by a large, white, stylized letter 'A' that serves as a background for the text.

It's undoubtedly the A350 XWB.
Offering 18" wide seats as standard
in economy, along with a 25% step
change in fuel efficiency and a 25%
lower seat-mile cost, it has unrivalled
low operating costs. The best bit? It's
already in the air.

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On Eng, Tong

COVER IMAGE

The T-50 jet trainer has been a success for national champion Korea Aerospace Industries – but Seoul's stealthy KFX has yet to match its flying start **P29**



BEHIND THE HEADLINES

Rotorcraft were the focus as **Dominic Perry** (above) went to the **Helitech** exhibition in London's docklands (**P18**). Elsewhere, **Murdo Morrison** heard **Piaggio Aerospace's** ambitions for the unmanned **HammerHead**, at its site in **Villanova D'Albenga** (**P22**)



Airbus

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Bell Helicopter, AirBeamImages

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IMAGE OF THE WEEK

Airbus Helicopters has unveiled a new Mercedes-Benz-styled version of its H145, with the VIP model featuring more comfortable passenger seats, wi-fi connectivity and "an improved infotainment system". The manufacturer has already sold four examples, with deliveries to start before year-end

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Marcus Schiller/Airbus Helicopters

THE WEEK IN NUMBERS

70%

With most of its commercial revenue coming from abroad, Boeing boss Dennis Muilenburg likes the TPP trade deal

Boeing

\$1.1bn

Alcoa's potential revenue from a nine-year deal to supply Lockheed Martin with airframe titanium for all F-35 variants

Alcoa

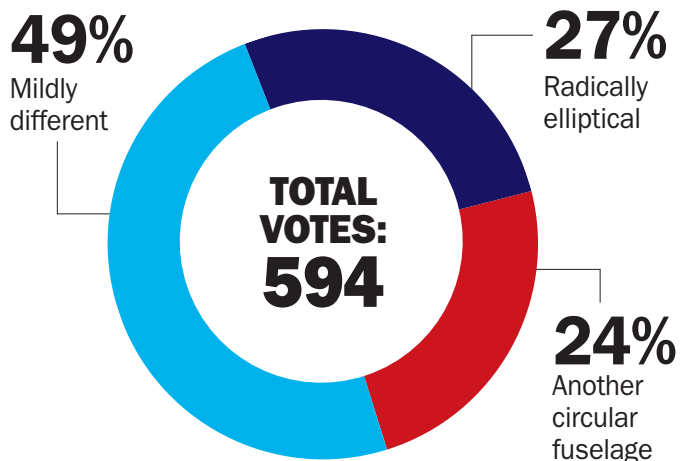
1,200

The number of NASA-patented technologies now on offer to US start-ups at no up-front cost, to encourage innovation

NASA

QUESTION OF THE WEEK

Last week, we asked: **If Boeing launches a 7M7, its design will be...?** You said:



This week, we ask: **Will Bombardier Aerospace survive on its own?**

- ☐ Yes, CSeries will save it
☐ Only making business jets ☐ No, merger is its only hope

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Nothing good for free

There are only three USA companies still capable of developing a stealthy combat aircraft, and the Department of Defense is worried that its bomber selection will neutralise one of them

Northrop Grumman's status as the US military's third source of stealthy combat aircraft is doomed, whether or not it wins the \$55 billion long-range strike bomber (LRS-B) contract from the US Air Force. At least, that's an argument that's been making the rounds for several months.

The reasoning goes, a victory for Boeing/Lockheed Martin leaves Northrop in an impossible position, forcing it to be swallowed by one of the LRS-B victors. If Northrop wins, on the other hand, Boeing's combat aircraft business is in jeopardy. Rather than write-off a valuable hedge to a commercial market downturn, Boeing would most likely try to acquire Northrop. It's an interesting theory, and it clearly has the US military brass worried.

Frank Kendall, head of acquisition, technology and logistics at the Department of Defense (DoD), has now asked Congress for new tools to prevent further top tier consolidation of the aerospace and defence industry.

If the DoD wants to keep three rivals in business, it does have to make it worth their while

Kendall cited concerns over Lockheed's pending acquisition of Sikorsky as the source of his request, but the timing suggests he also wants to send a message to the LRS-B bidders and their shareholders.

On the surface, it seems a case of the DoD wanting its stealthy bomber-shaped cake and eating it, too. If the DoD is funded to support only two stealthy aircraft programmes – Lockheed's F-35 and the still unclaimed LRS-B – then it can hardly expect industry to sustain three capable suppliers.



Take a bite out of that

But the DoD's position is not so unreasonable. The USA has awarded only four contracts to develop new combat aircraft over the last 30 years: the Northrop B-2, Lockheed F-22, Boeing F/A-18E/F Super Hornet and Lockheed F-35. It's been more than 15 years since the last B-2 was delivered, but Northrop has sustained the capability to design and produce new aircraft. It's been nearly a decade since Boeing completed development of the last derivative variant of the F/A-18, yet it is still capable of producing combat aircraft.

This longevity hasn't come for free. Northrop's skills, for example, have been sustained by involvement in the X-47B programme and, perhaps, a reportedly classified high-altitude intelligence-gathering aircraft.

The DoD's best tool to preserving competition is still the purse. If the department wants to keep three competitors in the combat aircraft business, it does have to make it worth their while. But history has shown that these companies do not require deals as large as the F-35 and LRS-B to stay in the game. ■

See This Week P9

Are Bombardier's woes getting CSeries?

Until the late hours of 6 October, matters seemed relatively under control in Montreal, where a new leadership team at cash-strapped Bombardier seemed to have opened some financial breathing space.

With \$3.1 billion in the bank and no major debt payments due until 2018, the transformation plan looked to be working, leaving management to focus on getting the CSeries through entry-into-service. Meanwhile, a revamped sales team redoubled efforts to secure elusive orders from marquee airlines and lessors.

Then came news that Airbus and Bombardier had broken off secret discussions – a revelation all the more stunning for showing that they had even met in the first place. After all, if Bombardier is not facing any immi-

nent technical or financial threat within the CSeries programme, why did it now seek help from Airbus – a company that has spent the last several years bad-mouthing and conniving to defeat the CSeries?

And, if Airbus spurned an offer, what options does Bombardier have left?

But perhaps this is a case of smoke without fire. A planned stock market sale of a minority stake in the rail transportation division may save the day, financing the CSeries production ramp-up, paying off debt and, with luck, hauling in a new raft of major orders.

Or perhaps not. In either case, the next several months look to be a very eventful period in Montreal. ■

See This Week P9



To find more coverage about military programmes, visit our dedicated landing page:
flightglobal.com/defence



BRIEFING

STAFF LOSSES LOOM AT AIR FRANCE-KLM

CUTS Air France-KLM plans to slash 2,900 jobs and retire its Airbus A340 fleet by 2017 as part of its restructuring “plan B”, after it failed to reach an agreement with unions last month. The redundancies will affect 1,700 ground staff, 900 flight attendants and 300 pilots, the airline group confirms. Flightglobal’s Fleets Analyzer database shows that Air France operates 13 A340-300s. It had planned to use these until 2019, but will instead retire them to reduce long-haul capacity. Pilot union SNPL has condemned the proposed measures.

INDONESIAN TWIN OTTER CRASH KILLS 10

ACCIDENT A de Havilland Canada DHC-6-300 Twin Otter operated by Aviastar Mandiri crashed at Mount Latimojong in South Sulawesi, Indonesia on 2 October, killing its seven passengers and three crew members. The aircraft, registered PK-BRM, was operating flight MV7503 from Masamba to Makassar when it lost contact 11min after taking off. Built in 1981, the Twin Otter had been acquired by the operator in February 2015.

JAPANESE F-35 ASSEMBLY DRAWS NEAR

MANUFACTURING Northrop Grumman has completed the centre fuselage section for AX-5 – the first Lockheed Martin F-35 which will be completed at Japan’s final assembly and check-out plant in Nagoya. Some 38 of Japan’s 42 F-35As will be assembled at the Mitsubishi Heavy Industries-run plant, with the first expected to roll off the line in 2017. Its first four will be completed in Fort Worth, Texas, emerging from the second quarter of next year.

SUPERJETS COULD BE HEADING TO CITYJET

FLEET Irish regional carrier CityJet is close to finalising an order for 15 Sukhoi Superjets to replace BAE Systems Avro RJ85s, according to sources familiar with the proposal. A deal, also to include options for additional Superjets, will be confirmed at the European Regions Airline Association general assembly in Berlin between 13 and 15 October, they indicate. Flightglobal’s Fleets Analyzer database shows CityJet’s current fleet as comprising 18 RJ85s and one Fokker 50.

THAILAND TO INCREASE AW139M FLEET

ROTORCRAFT The Royal Thai Army is to increase its fleet of AgustaWestland AW139M utility helicopters to 10 units, after awarding the manufacturer a follow-on order for eight of the intermediate twins. Deliveries of the rotorcraft will be completed before the end of 2016, the company announced at the Helitech exhibition in London.

USAF LOSES C-130J IN AFGHANISTAN

CRASH Eleven people died when a US Air Force-operated Lockheed Martin C-130J crashed in Afghanistan on 2 October, in what was the service’s first fatal accident involving the tactical transport. Six crew members and five civilians were killed when the aircraft crashed shortly after taking off from Jalalabad air base. Flightglobal’s Fleets Analyzer database records there as being 323 C-130J and derivative aircraft in active use around the globe, with 15 nations operating the type. The USAF accounts for 160 of this total.

NEO ORDER FOR CROATIA AIRLINES

COMMITMENT Croatia Airlines is to acquire four Airbus A320neos, the airframer disclosed in its September order and deliveries breakdown. The Star Alliance carrier’s commitment takes the combined total of A320neo-series aircraft on order beyond 4,300.



Configuration of the RAF model is due to be finalised in March

PROGRAMME BETH STEVENSON LONDON

Reaper the basis for Protector plan

A new iteration of the General Atomics aircraft will have greater range and endurance, according to UK ministry

The UK’s newly-announced Protector unmanned air vehicle programme will be delivered using a derivative of the General Atomics Aeronautical Systems MQ-9 Reaper already operated by the Royal Air Force, the Ministry of Defence confirms.

UK Prime Minister David Cameron on 4 October revealed plans to replace its 10 Block 1 Reapers with “more than 20” new aircraft. The Protector activity succeeds its previous Scavenger programme, which sought to field a new medium-altitude, long-endurance type by 2020.

The future model will have “greater range and endurance”, and be equipped to “identify, track, deter and ultimately counter potential threats”, the MoD said, without elaborating.

Speaking at the Royal Aeronautical Society’s remotely piloted air systems conference in London on 7 October, Air Cdre Peter Grinstead, the MoD’s head of UK unmanned air systems, revealed a new Reaper will be selected, with its exact configuration to be finalised after a Main Gate investment early next year.

“A decision will not be made until March,” he says, but confirms: “it will be an upgrade of the Reaper Block 1 with extra capability.”

The UK could choose to

acquire UAVs in General Atomics’ current Block 5 configuration, or in a certifiable Predator B variant which is now in development. The latter will feature an integrated sense and avoid system in the nose section, plus longer wings and modified internal fuel tanks for extended-range performance.

RAF Reaper operations began in Afghanistan in 2007, and the armed type is involved in coalition activity against Islamic State militants in Iraq and Syria. The service’s older examples are already approaching the end of their operational lifespan.

Meanwhile, BAE Systems’ Taranis unmanned combat air system demonstrator will carry out a third phase of flight tests towards the end of this year, building on previous work performed at the Woomera test range in Australia.

“When we have these results, we will assess the feasibility of further work,” says Sqd Ldr Archie Brown, of the MoD’s unmanned air system team.

An Anglo-French team of six companies is almost halfway through a two-year feasibility study to assess requirements for a potential bilateral combat aircraft. “We are assessing data collected by the partners to downselect to one [aircraft] design. The downselect will be made in the next month,” Brown says. ■



F-35C finds its sea legs in fresh trials
THIS WEEK P10

INDUSTRY JAMES DREW WASHINGTON DC

DoD challenged by mergers

Pentagon rues loss of contractors such as Sikorsky and warns against more consolidation

The Pentagon has very few tools in its arsenal to constrain major mergers and acquisitions between prime contractors – a fact that has become all-too apparent to defence acquisition chief Frank Kendall with Lockheed Martin's \$9 billion take-over of Sikorsky.

Kendall has re-affirmed his concerns about further consolidation of the US defence industrial base, and cautions against ending up with just two or three massive prime contractors supplying most of America's weapon systems – a situation he says is bad for the government, the military and, ultimately, the taxpayer.

Speaking at an event in Washington DC on 6 October, Kendall lamented the loss of names like McDonnell Douglas, Grumman, Martin "and now Sikorsky" to industry consolidation, but he stopped short of lambasting the Lockheed acquisition specifically.

"I like competition; I like having multiple sources and I do think – as I mentioned in my statement last week – size does confer a certain degree of power," says Kendall. "That's not a judgement, it's just a fact." He concedes that corporations are



Lockheed's \$9bn deal for Sikorsky has been cleared to proceed

driven to act in the interests of their shareholders, but says the government "has an interest in maintaining a good competitive environment and maintaining a range of suppliers."

Kendall fired a warning shot at major defence firms in late September, saying that the Department of Defense will work with US lawmakers to "explore additional legal tools and policy" to preserve diversity among the industrial base, describing the current trend as "troubling".

This could include factoring in national security considerations to the merger approval process.

His statement came less than a week after the Department of Justice approved Lockheed's acquisition of Sikorsky from United Technologies, with the deal potentially now closing in late 2015.

Kendall's comments have received widespread rebuttal from industry groups, however, which blame budget uncertainty for the consolidation. ■

INVESTIGATION

STEPHEN TRIMBLE WASHINGTON DC

NTSB confirms source of 777 engine failure

US safety investigators have confirmed an uncontained failure of a GE Aviation GE90-85B engine led to a fire and aborted take-off for a British Airways Boeing 777-200 last month. The engine manufacturer is performing "focused inspections" on other GE90s, says the US National Transportation Safety Board, which on 6 October published the first update from the investigation in three weeks.

GE is inspecting 38 GE90s of similar vintage to the engine involved in the 8 September incident at McCarran International airport in Las Vegas, Nevada. The engines are in storage, says GE. The affected example was made in 1995, the year the 777 entered service, making it among the oldest in operation, it says. About 176 engines are in service from the original series, featuring 312cm (123in) fan diameters, versus the 325cm of the later -115B.

An explosion in a section of the high pressure compressor caused breaches in the engine case and cowling, the NTSB says. A fracture began in the Stage 8 disk web of the high-pressure compressor section. ■

STRATEGY STEPHEN TRIMBLE WASHINGTON DC

Bombardier, Airbus confirm ending of secret talks

Troubled Bombardier has come in for fresh scrutiny after revealing it has been in talks – since ended – with Airbus regarding "business opportunities" and "industry consolidation".

No further details on the dialogue have been released beyond those in Bombardier's vague statement and both parties stress "such discussions are no longer being pursued".

Bombardier attributes the talks to the company's broader strategic review, initiated when Alain Bellemare became chief executive this year, taking over as de-

lays and weak sales of the CSeries and other development programmes put the company in a financial crisis.

"As previously mentioned, Bombardier will continue to ex-

plore initiatives such as a potential participation in industry consolidation," Bombardier says.

Speculation has focused on whether the aerospace business was being offered for sale, simply

the commercial aircraft portfolio, or some or all of the CSeries programme which partly competes with the A320neo family.

Bombardier had previously collaborated with Chinese manufacturer Comac, attempting to increase the level of commonality between the CSeries and the latter firm's C919.

Certification of the 110-seat CS100 is scheduled for later this year, and entry into service with Swiss International Air Lines should follow in the first half of 2016. The larger CS300 should arrive around six months later. ■



Certification of the 110-seat CS100 variant is due later this year



PROGRAMME JAMES DREW WASHINGTON DC

F-35C finds its sea legs in fresh trials

Developmental testing aboard Nimitz-class aircraft carrier designed to evaluate Lightning II's performance for the US Navy

Two US Navy Lockheed Martin F-35C test aircraft have begun a second round of developmental testing aboard the aircraft carrier USS *Dwight D Eisenhower*, aimed at smoothing the aircraft's entry into service in 2018.

The arrival of Air Test and Evaluation Squadron 23's aircraft CF-03 and CF-05 on 2 October came as the F-35 joint programme office announced the first external weapons release from an F-35. Four inert, laser-guided 227kg (500lb) bombs were successfully released from test aircraft CF-02 at the navy's Atlantic Test Range in Maryland in late September.

Marking the second time that F-35Cs have conducted developmental testing aboard an aircraft carrier, the *Eisenhower* deployment will be followed by a third and final evaluation next year.

"These sea trials will further expand the F-35C's flight envelope," says F-35 programme executive officer Lt Gen Christopher Bogdan. "The testing will prepare us for next year's final at-sea developmental test and keep us on track to support the navy's 2018 initial operational capability date."

A Nimitz-class aircraft carrier, the *Eisenhower* underwent modification prior to accepting the F-35Cs. This included installing rebuilt jet blast deflectors for its aircraft launch cata-



The type is set to achieve initial operational capability in 2018

pults one and two. The navy says the deflectors were redesigned to better withstand the exhaust from the type's Pratt & Whitney F135 engine, and also to protect the crews and equipment on the flight deck during take-offs.

Improvements were also made

to the carrier's arresting – or trapping – unit, with the installation of an advance recovery control (ARC) system.

"When an aircraft lands, no matter what cable it catches, the ARC system will only allow that aircraft to travel a total of 183ft [55.8m] down the landing area,"

the navy says.

During the current "DT-II" activity, the deployed F-35Cs will perform multiple take-offs and arrested landings. The navy will also be assessing its ability to support the aircraft at sea by conducting live and simulated maintenance operations, as well as fit checks of the aircraft and its maintenance gear on the vessel.

The USN has not introduced a new combat aircraft since the Boeing F/A-18E/F Super Hornet. By 2025 the service's carrier-based air wings will be comprised of Super Hornets, electronic-attack-ruled EA-18G Growlers, and Lockheed F-35Cs, along with Northrop Grumman E-2D airborne early warning and control system aircraft and Bell Boeing V-22 tiltrotors tasked with delivering logistics support. ■

CONCEPT

High-powered laser weapon could help Lightning II strike

Lockheed Martin says it is already exploring concepts for installing and employing a high-power fibre laser weapon on the F-35, which would enable the stealthy type to shoot down missiles and airborne threats.

A 60kW, ground vehicle-mounted example that uses spectral beam combining to channel energy from a stack of individual fibre laser

modules into a "single, high-power, monolithic beam" will enter production for the US Army later this month. An airborne derivative could be offered to the US Air Force by the end of this decade, Lockheed says.

"We're looking at concepts for the integration of a laser weapon onto the F-35," says Lockheed's senior fellow for laser and sensor systems,

Rob Afzal. "We're also doing models and calculations so you would understand the utility of a laser weapon system in the F-35."

The USAF is pursuing laser weapon systems for installation on types like the Lightning II, as well as the Lockheed AC-130J Ghost rider gunship being built for its special operations command. ■

FLEET MICHAEL GUBISCH LONDON

Finnair starts long-haul transformation with A350

Finnair has become the first European operator to receive the Airbus A350, taking delivery of its first example on 7 October.

Three more of its 19 on-order -900s are due to be handed over by year-end, followed by seven more in 2016-2017 and the remainder by 2023.

Regular passenger flights were due to begin on 9 October, initially to support crew familiarisation on routes to Am-

sterdam and Oslo. The One-world carrier, which will deploy the type on its first long-haul service on 21 November – to

Shanghai – says the aircraft will provide the "backbone" for its network expansion strategy to Asian destinations.



Early destinations for the new twinjet are to include Shanghai

"With the A350, we get the fleet that our strategy requires, and we can start building our growth," says chief executive Pekka Vauramo.

Finnair – which follows Qatar Airways and Vietnam Airlines in introducing the A350 into service – has configured the wide-body twinjet to accommodate 297 passengers: 46 in business class, 43 in premium economy and 208 in economy. ■



Emirates chief cool
on big twin order
AIR TRANSPORT P21

THIS WEEK



A speed of 175kt has
been attained so far

PROGRAMME DOMINIC PERRY LONDON

H160 powers ahead as Arrano testing starts up

Airbus Helicopters will shortly begin trials on its Dynamic Helicopter Zero test rig of the first pair of Turbomeca Arrano engines for the H160 programme.

Following recent delivery of the two 1,100-1,300shp (820-969kW) turboshafts to the airframer's Marignane facility in the south of France, they were briefly installed on the second H160 prototype for ground evaluations, says Aurélie Gensolen, marketing product manager for the new helicopter.

These are now being fitted to the Dynamic Helicopter Zero, with trials to begin imminently.

Two flight-test engines will then arrive in mid-October, says

Gensolen, enabling the maiden sortie of the second helicopter before year-end.

Due to a relatively last-minute decision to drop Pratt & Whitney Canada from the programme, first flight of the H160 was performed using its PW210 powerplants.

That aircraft has so far accumulated 30 flight hours since its mid-June debut, with 70h also amassed on the test rig.

Flight tests have proceeded "even faster than expected", says chief executive Guillaume Faury, with the helicopter taken to a speed of 175kt (324km/h) and 10,000ft altitude. ■

See Show Report P18

COMPETITION DOMINIC PERRY LONDON

Airbus insists X9 is best for Japan

However, Bell Helicopter maintains that Tokyo's selection of its 412EPI-based bid for UH-X contest will not be overturned

Japan's defence ministry is unlikely to reverse its decision to award a major procurement contract to a combined Bell Helicopter/Fuji Heavy Industries team – at least in the view of Bell chief executive John Garrison.

Rival Airbus Helicopters, whose losing clean-sheet bid was made with local partner Kawasaki Heavy Industries, has suggested that Tokyo could reconsider its selection of the Bell 412EPI-based solution for its UH-X programme.

Guillaume Faury, chief executive at the France-headquartered airframer, describes the 412 as "a very old platform" that does not offer Japan the basis for a helicopter that will be an export success or feature modern technology: two of the key objectives for the procurement. Faury travelled to Japan in early October to present its argument.

The Bell/Fuji team was chosen by Tokyo in July to produce

around 150 examples of their Bell 412-derived UH-X offering for the Japan Ground Self-Defence Force.

Improvements over the current iteration of the 412EPI include state-of-the-art avionics, upgraded transmission, and an increased maximum gross weight.

The Japanese-built helicopter will also be offered to the export market, although Bell will retain the ability to manufacture it in the USA if required, says Garrison.

He dismisses Faury's stance, pointing to the defence ministry's evaluation process, which had seen its proposal ranked first in six out of seven selection criteria.

But Faury insists that an offer to jointly develop a new 4.5-5t twin-engined helicopter, the long-rumoured X9, would be of greater benefit to Japan's aerospace industry in the long term than modernising "a platform that is currently being retired around the world". ■

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As the largest customer for the A380, Emirates is urging Airbus to launch a Neo variant



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FLEET MURDO MORRISON LONDON

Emirates chief cool on big twin order

Airline CEO Tim Clark plays down prospects of commitment at Dubai air show for either Airbus A350 or Boeing 787

Emirates Airline will not choose between the Airbus A350-900 or the Boeing 787-10 until next year, chief executive Tim Clark has confirmed – quashing speculation that next month's Dubai air show might bring a high-profile widebody order from the local flag carrier.

Clark has also ruled out a commitment at the show to acquire more Airbus A380s – although he is still urging Toulouse to launch a revamped “A380neo” variant of the superjumbo.

Emirates has “all the data we need to make an assessment” of the baseline A350 and the stretched Dreamliner, although a decision is “not imminent”, Clark tells *Flight International*.

“It will be in 2016 – but when, I don't know – and it will be one or the other,” he adds.

Emirates cancelled its original order for 70 A350-900 and -1000s last year, but Clark says he is happy with revised performance numbers from Airbus, now the -900 has entered service. “We are now getting meaningful figures,” he says. “The originals were just estimates.” Clark had also expressed concerns over the 787-10's

hot-weather performance in the Gulf summer. He says “there are still issues with the -10”, but maintains that Emirates has been “testing it on paper” and is satisfied it could fulfil a role.

“We wouldn't put it on New York or Sydney, but as a work-horse up to 8.5h without a kink in the payload, it looks like a good aeroplane,” he says.

Clark says he does not think Airbus will launch an A380neo at the air show and suggests Emirates would not be able to incorporate any more of the ultra-

large aircraft at its close-to-capacity Dubai International (DXB) base for now anyway.

However, he remains keen on a new version of the superjumbo. “If [Airbus] do develop it, it would be of interest to everybody, and I'd like to see them sell more A380s,” he says.

An A380neo would not have to be bigger, he adds, but a new engine and aerodynamic tweaks could make the existing A380 up to 13% more economical.

Despite congestion at DXB, Clark says the new Dubai World

Central, or Al Maktoum International, will not be ready for Emirates to relocate passenger operations until the second half of the 2020s. The new airport, in the Jebel Ali district south of Dubai, is earmarked to become the world's biggest hub but currently consists of one runway and a modest terminal building, and is used mainly as a cargo airport and by a handful of carriers.

“We are having to manage a very compressed airport here [DXB] and it's focusing a lot of our attention,” says Clark. ■

DISPUTE MURDO MORRISON LONDON

Clark hopeful that ‘sense will prevail’ in US subsidy row

Emirates Airline chief executive Tim Clark doubts the USA will restrict its operations because of the “enormous reverberations” it would have on global trade and international relations. Speaking to *Flight International*, Clark pledged to increase Emirates' US services – the source of 10% of the carrier's revenue – despite the opposition of the nation's big three airlines; American Airlines, Delta Air Lines, and United Airlines. They are lobbying their gov-

ernment to revise bilaterals with the United Arab Emirates and Qatar on the grounds that Emirates, Etihad Airways and Qatar Airways are unfairly subsidised.

Dismissing the US majors' claims as the “pot calling the kettle black”, Clark says: “Our plans are very much to do with expansion. We are looking at more points.”

Likening the spat to a “game of tennis” with both sides trading submissions, Clark says any move to

restrict access by the US authorities would be tantamount to “revolution”. He adds: “If the worst comes to the worst – and I don't for a minute think it will – the amount of unravelling of global political structures would be incredible. I am hoping that sense will prevail.”

Emirates on 1 October launched its second daily flight to Boston – one of 10 US cities it now serves, after starting operations to New York 11 years ago. ■



Trigana crash crew
received no ground
proximity alerts
INVESTIGATION P14

DEMAND LAURA MUELLER PRAGUE

Airframers can anticipate orders bonanza from Iran

Thawing of relations and sanctions removal will drive urgently-needed fleet rejuvenation

The lifting of sanctions against Iran will create a home for used and older-generation aircraft types during a critical period before airframers start to deliver new-technology variants, according to speakers at the ISTAT Europe conference in Prague.

David Goodger, director for Europe at Oxford Economics' tourism-focused subsidiary, notes that while a similar thawing of relations with Cuba will have a minor aviation impact, Iran is a "much larger market with a much higher population, and that will add international travel. Roughly another 30 million passengers per year could come out of Iran, with

moderate GDP growth. More could happen with strong GDP growth, so the potential is higher."

Peter Morris, chief economist at Flightglobal's Ascend consultancy, says a full spectrum of aircraft will be needed in Iran, "from used to new, to regionals, narrowbodies and widebodies".

Morris recalls, in 2000 he talked about aircraft availability with Iran Air's chief executive, whose reaction was: "When can you get it here?" "That was 15 years ago – things have gotten worse in terms of availability of aircraft," he adds.

The opening up of Iran is a "welcome move", says an

unnamed lessor: "It creates a home for a lot of these [Airbus] A330s and [Boeing] 777s that are coming available, as well as the 737s and A320s that will need homes once the 737 Max and A320neo arrive."

The 160 passenger jets in service with Iranian airlines have an average age of 22.9 years, Flightglobal's Fleets Analyzer database shows. This compares with an average age of 10 years for the 20,500 commercial jets in airline passenger service globally.

Iranian officials have said the country needs to spend \$20 billion on 400-500 aircraft in the next decade to rejuvenate the fleet. ■



Passenger aircraft in the nation average 22.9 years old, according to our Fleets Analyzer database

CONVERSIONS
OLIVIER BONNASSIES PRAGUE

Cargo door approval opens market for ATR

Swiss-based IPR Conversions has completed the acquisition of supplemental type certificates developed by ATR parent Alenia Aermacchi for two related freighter conversion modifications to the twin-turboprop.

Pending approval by regulators the European Aviation Safety Agency, the US Federal Aviation Administration and Transport Canada, the transaction will allow IPR to market the structural-tube and large-cargo-door conversions on ATRs. The 116in x 71in (295cm x 180cm) door size allows the loading of very large pieces of cargo and, in a containerised version, can accommodate five full-height – 88in x 108in – containers; or seven LD-3s. IPR says the certificates also cover the addition of window plugs.

ASI Maintenance, part of ASI Innovation based in Toulouse, will perform the conversions.

At the ISTAT Europe conference in Prague, IPR managing director Christian Degouy said the company has secured first orders from leasing companies Willis Lease and ASL Aviation.

"The first aircraft [MSN241] is undergoing a structural-tube conversion and is scheduled for redelivery later this month", Degouy says. It will go to Canadian carrier Summit Air.

A second example, MSN387, will undergo a tube and large-cargo-door conversion for ASL, for eventual delivery to DHL as an ATR 72-200F in February 2016. ■

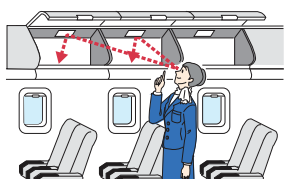
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INVESTIGATION GREG WALDRON SINGAPORE

Trigana crash crew received no ground proximity alerts

CVR data suggests warning system was not activated before ATR 42-300 crashed into ridge

Preliminary investigations into the fatal crash of a Trigana Air Service ATR 42-300 on 16 August indicates that the crew received no ground proximity warning system alerts before crashing into an 8,300ft ridge.

An initial report from Indonesia's National Transportation Safety Committee (NTSC) into the crash, which killed 49 passengers and five crew, is based on data from the aircraft's cockpit voice recorder (CVR). This indicates the crew was not performing checklist procedures at the time of its loss.

The crash occurred while the aircraft, PK-YRN, was operating flight IL267 from Sentani to Oksibil in Indonesia's mountainous Papua province. The skies were mostly clear, with broken clouds at 8,000ft and moderate winds blowing at 8kt (15km/h).

The aircraft had departed at 15:04 local time, and contacted the Oksibil Aerodrome Flight Information Services (AFIS) at 15:55, reporting that it was cruising at 11,500ft over waypoint ABMISIBIL. The controller ac-



The 49 passengers and five crew aboard the turboprop were killed

knowledgeed the message, and the pilot said the aircraft would fly a direct base leg routing to runway 11, which sits at an elevation of 4,000ft in a valley.

Five minutes later, the AFIS officer had yet to hear from the aircraft, which should have been on final to runway 11. He tried to contact the aircraft but received no reply. Calls to airfields nearby revealed that PK-YRN had not diverted. Search and rescue services were activated, but the wreckage was not located until the next day.

Apart from the CVR detail, the report sheds little new light on the causes of the crash. Indonesian authorities were unable to download information from the flight data recorder, and this will now be attempted by French investigation agency the BEA.

The NTSC, however, has issued recommendations stressing that Trigana flight crews must comply with procedures such as briefings, checklists, approach procedures and visual flight rules minima, as well as monitoring. ■

INQUIRY DAVID KAMINSKI-MORROW LONDON Zest Air MA60 report highlights inexperience

Low levels of experience of the captain and poor weather contributed to a Xian Aircraft MA60 landing accident at Caticlan nearly seven years ago, investigators from the Civil Aviation Authority of the Philippines have said.

The Zest Air turboprop, RP-C8893, had executed a go-around and was attempting a second approach to runway 06, following a flight from Manila on 11 January 2009. The aircraft undershot the runway and struck an embankment. Its left-hand main landing-gear failed, causing it to veer to the left and come to a halt on the airport ramp. Three of the 22 passengers suffered serious injuries, and the MA60 was written off.

The investigation authority says runway conditions were "critical", with gusting winds, 950m (3,120ft) visibility and no precision-approach path indicator lighting. It also states that the captain had a "low level" of experience, with fewer than 500h in command from an overall 2,675h.

Zest Air was temporarily grounded over safety concerns in 2013, before re-emerging as AirAsia Zest. ■

INCIDENT ELLIS TAYLOR SINGAPORE

Unstable approach led to Cardig Air 737 mishap

Indonesia's Cardig Air has emphasised the importance of stable approaches to its crews following an accident involving a Boeing 737-300 Freighter on 28 August.

Details were released by Indonesia's National Transportation Safety Committee (NTSC) in a preliminary report on the incident, which occurred on landing at Wamena, Papua, after a service from Jayapura.

The 737, PK-BBC, was positioned for landing on runway 15, and had received clearance from the airport's control tower. However, the freighter touched down 35m short of the runway,

resulting in the collapse of its left main landing gear, and major damage to the left wing and CFM International CFM56 engine. Both pilots escaped uninjured.

Data from the 737's flight-data

recorder shows a vertical acceleration of 3.68g on impact, says the NTSC. It also showed three further instances in the aircraft's previous 107h of flight time where landings exceeded 2.1g.



Indonesian operator will review training and operating practices

Cardig Air says it will review training and operating practices for operating in Papua, and has reaffirmed guidance to pilots to make a go-around if their aircraft is unstable on final approach.

The NTSC recommends that the operator monitors flight crew performance and maintenance intervals on aircraft with frequent high vertical accelerations during landing.

It also made recommendations to Wamena airport to develop an aerodrome maintenance programme, improve its runway inspection system, and install a visual approach slope indicator. ■



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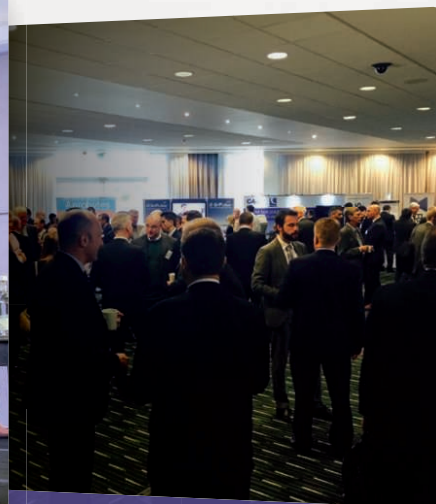
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HELITECH 2015
SHOW REPORT P18

R&D STEPHEN TRIMBLE WASHINGTON DC

Advanced material proves its mettle

Ceramic matrix composites being developed by GE Aviation for the GE9X engine have passed initial endurance testing

Ceramic matrix composites destined for use on the General Electric GE9X engine have passed the first phase of endurance testing with no red flags, despite a surprise exposure to an unplanned engine surge.

Boeing expects the 777-9X to enter service in 2020 with two GE9X engines offering 10% lower specific fuel consumption than the GE90-115B engines that power the 777-300ER. Part of that fuel efficiency gain is achieved by raising pressure levels inside the engines, which increases internal temperatures beyond the practical reach of metal alloys.

So GE is relying on CMCs in several key engine components, including the inner and outer combustor liners, the shrouds around the Stage 1 high-pressure turbine (HPT) and the nozzles for the Stage 1 and Stage 2 HPT. CMCs are lighter than metal and can survive in hotter temperatures, but have been rarely used because of concerns about durability, thermal shock and the cost of production.

GE plans to start building the first GE9X core for testing next year, so the engine maker believed it was essential to verify that the CMC materials work as promised.

Testing began in March with combustor liners and HPT shrouds and nozzles that GE scaled down for a GENx demonstrator engine. The ground rig testing will run through a full service life of 20,000 cycles, but the manufacturer paused the testing in August after completing 2,800 cycles to see how the components had fared. "It was a big success for us," says Jonathan Blank, general manager of CMC and advanced polymer matrix composite research at GE Aviation. "It was a validation of our design and manufacturing processes."

The testing pause allowed GE engineers to check for signs of thermal damage or stress. CMCs are made with toughened resins that make the material much stronger than ceramics alone. The



The GE9X for the 777X is targeted to deliver a 10% cut in specific fuel consumption over the GE90

material has been deployed as the combustor liner and HPT Stage 2 shrouds in the CFM International Leap engine, in which GE has a 50% share, which will eventually power the Airbus A320neo, Boeing 737 Max and Comac C919. But the GE9X environment includes a 20% higher pressure ratio than found inside the Leap, with elevated temperatures and stresses. The GENx demonstrator testing offered the first chance to evaluate how the material would perform in such an environment.

GE is still analysing the test results, but early checks and visual

inspections revealed no damage, Blank says. "The engine proved out the technology in a similar temperature and stress engine environment for us," he says.

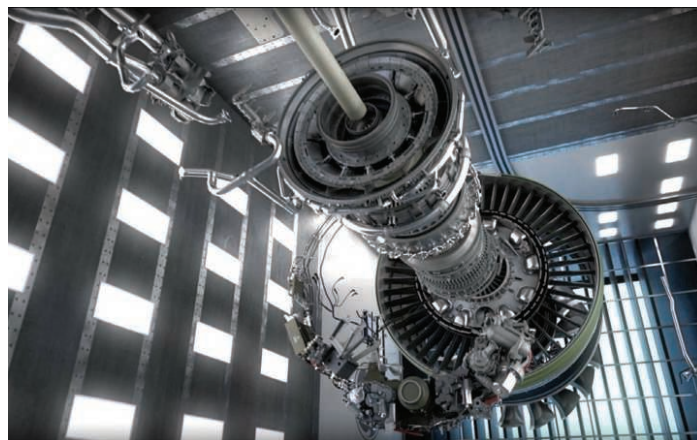
One risk of ground-based demonstrator testing is that the environment is so controlled it falls short of the random reality of operational service. But the recent series of tests on the GENx demonstrator provided a random element when the engine experienced a violent surge. The cause was traced back to what Blank vaguely describes as a lapse in the testing environment.

But the event offered the tests rare early data on how the material performs in such an incident. There were "no issues whatsoever", Blank says. The CMC components were inspected, but allowed to remain in the engine.

Meanwhile, GE's production system is taking shape several years before the production ramp-up begins for the 777-9X.

The manufacturer created a vertically integrated supply chain for CMC components, Blank says. New ideas for components and production concepts are hatched at GE's laboratory in Evendale, Ohio. As concepts mature into products and production processes, they are handed to a facility in Newark, Delaware. That facility accepts prototypes from Evendale and turns them into production hardware with tooling and jigs. Finally, the Newark facility hands off ideas to a full-rate production facility in Asheville, North Carolina, where the workforce is focused solely on production.

The system is operating now to support the ramp-up of the Leap engine programme, which begins in earnest next year as the A320neo enters service. ■



Demonstration testing is being conducted with an adapted GENx

HELITECH 2015



London's Excel exhibition centre was the venue for a subdued rotorcraft industry's annual European gathering from 6 to 8 October. With the offshore oil and gas segment in a crude price-driven slump, and other sectors stuttering, manufacturers are focusing on customer service. But with a number of new programmes under way – notably the Bell Helicopter 505 and Airbus Helicopters H160 – airframers were keen to emphasise that development activity has not stopped. Added to that was an increased focus on the medium segment, with AgustaWestland already working to add new capabilities to its recently certificated AW169 and Airbus Helicopters announcing an avionics upgrade to its H135 light twin. Lessors were out in force too, with Waypoint adding to its backlog. Dominic Perry reports

DEVELOPMENT

Garrison staying positive despite minor 505 delay

Bell Helicopter has confirmed a three-month delay to certification for its developmental 505 Jet Ranger X, with the milestone moving to the first quarter of 2016. Initial handover to an undisclosed customer will follow shortly after, says Bell chief executive John Garrison, conceding the manufacturer's "aggressive timeline" had "slightly slipped".

Garrison remains upbeat on the 505 though, with the three prototypes having accumulated over 400 flight hours since the maiden sortie in November 2014.

"If we are within 90 days of our original forecast from two years ago, then I'm happy," he says.

Bell has amassed over 340 orders for the Turbomeca Arrius 2R-powered light single.

Work on the initial production aircraft has begun at the airframer's new final assembly line in Lafayette, Louisiana as Bell attempts a "pretty significant ramp-up" of the programme.

"The challenge there is to ensure that the supply chain is ready to go," Garrison says.

Turbomeca has already delivered the first serial Arrius 2R turboshaft and wants engine certification by year-end, says its chief executive Bruno Even. ■

PROGRAMME

AW169 in line for upgrades as deliveries get under way

Manufacturer works to boost performance of newly certificated medium-twin helicopter

AgustaWestland expects deliveries of its new AW169 to be into double figures by the end of 2015 as it works to add further capabilities to the 4.6t rotorcraft, including, potentially, full ice protection.

Since gaining European Aviation Safety Agency certification in July, the airframer has delivered one AW169 to an undisclosed customer, with an emergency medical services (EMS)-roled example to be handed over next month.

Next steps include validation of a rescue hoist and expansion of the flight envelope – raising cruise

speed to around 150kt (278km/h) through tweaks to the engine management software. This will be followed in 2016 by dedicated offshore approach procedures and a level D full flight simulator.

Future work is likely to include an increase in maximum take-off weight, says the manufacturer.

Certification of its Limited Ice Protection System is provisionally targeted for early next year, assuming this winter's tests go to plan, says the company.

It will consider the future integration of the more comprehensive Full Ice Protection System.

"If we have a launch customer, we will start this initiative," says the company.

Initially the Pratt & Whitney Canada PW210A-powered helicopters are being built at its site in Vergiate, Italy, although once US Federal Aviation Administration certification is secured in 2016, a second production line in Philadelphia will come on stream in the middle of next year.

AgustaWestland had a production AW169, destined for the Dubai Air Wing, on display at Helitech, alongside a mock-up of the type in EMS configuration. ■



AgustaWestland displayed a VIP-roled AW169 at Helitech, to be delivered to the Dubai Air Wing



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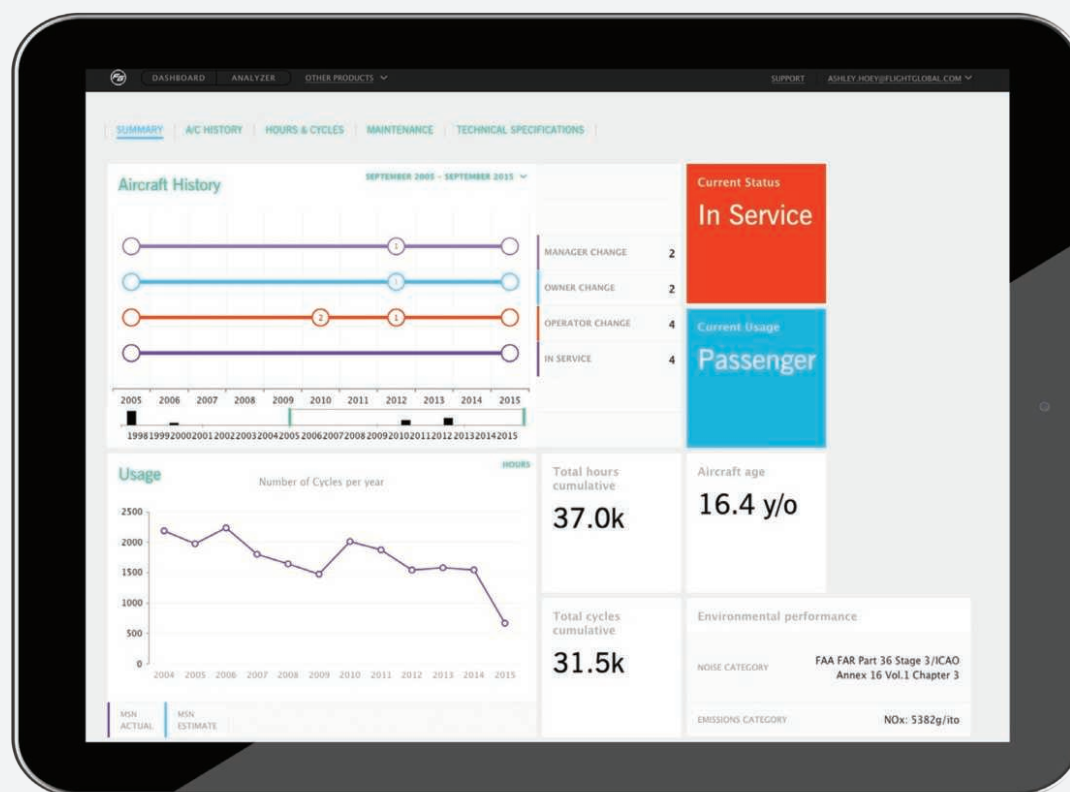


Illustration shows conceptual data only



HammerHead on track for new sale
DEFENCE P22

MARKET

Lessors tout diversification

Sector's big three leasing firms emphasise breadth of portfolios in face of oil and gas woes

The rotorcraft industry's trio of big lessors were out in force at Helitech – each emphasising that business continues to be strong despite the downturn in the oil and gas segment that is afflicting heavy helicopter operators.

All three companies point to an increasingly diverse asset portfolio as a sign that they have focused on more than just the off-shore segment. Demonstrating this trend, Waypoint Leasing announced at the show a deal for up to 20 Airbus Helicopters H135 light twins – the first commitment for the type from any lessor.

Deliveries of the helicopters are provisioned for the period to 2019, with an initial batch of three due to arrive next year.

No engine selection has been made yet, says Waypoint chief executive Ed Washecka, with the exact balance between the Pratt & Whitney Canada PW206BB- and Turbomeca Arrius 2B2plus-powered variants “ultimately driven by the end user”.

Washecka points out that Waypoint has had emergency medical services and firefighting helicopters in its portfolio “since the first six months”, and last



Waypoint intends to take up to 20 units of the H135 light twin

year placed an order for the larger H145. “We have been focussed on the EMS and parapublic markets for some time,” he says.

Waypoint has also signed a joint agreement with Airbus Helicopters to promote leasing solutions for the latter's products.

Additionally, Waypoint unveiled a separate deal at Helitech with AgustaWestland for the acquisition of 18 helicopters – covering the AW139, AW169 and AW189 – for delivery in the period from 2016-2019.

Neither of the other two big lessors in the space – Lease Corp International (LCI) and GECAS-owned Milestone Aviation – placed new orders, however.

Daniel Rosenthal, president of Milestone, points to its existing “strong framework agreements” with the helicopter manufacturers, including those signed at the Paris air show in June, as fulfilling “what our customers need”.

It has recently focussed on customer relations, opening five new offices across the globe and bolstering its team.

LCI, meanwhile, announced the placement of an AW169 with German offshore services provider Heliservice International, for delivery in the second half of 2016. Two further examples of the medium twin will enter service before year-end, says LCI chief executive Mike Platt. ■

ENHANCEMENT

Helionix avionics upgrade due for H135 light twin

Airbus Helicopters is to further upgrade the H135 light twin with the addition of its Helionix avionics suite – which includes a glass cockpit and four-axis autopilot – and has signed up Norwegian emergency medical services operator Norsk Luftambulans (NLF) as launch customer.

Delivery of the first of three examples equipped with the enhanced avionics package – and which also gain a modification to the aft cabin roof – to Drøbak-based NLF will take place in 2017, the manufacturer says.

Initial flight tests of the upgraded helicopter have already begun at its Donauwörth, Germany fa-

“Initial flight tests of the upgraded H135 have already begun”

AXEL HUMPERT

Head of H135 programme, Airbus Helicopters

cility, says programme head Axel Humpert, with the modified rotorcraft currently having the four-axis autopilot installed.

Certification is targeted for the end of 2016, with deliveries starting the following year.

The avionics upgrade brings the H135 in line with other members of the Airbus Helicopters range that are already fitted with Helionix, including the H145, H175 and developmental H160.

Production of rotorcraft to the previous standard will continue into 2017 – or even 2018 if there is sufficient demand, says Humpert – to “allow customers fleet commonality”. Eventually, however, Helionix will be the only option.

A previous upgrade to the type, raising it to the P3/T3 standard, focused on their respective Pratt & Whitney Canada and Turbomeca engines. However, earlier P2+/T2+ models are still being produced, although these will be phased out in a similar 2018 timeframe, says Humpert. ■

MODIFICATION

Bond delivers upgrade for UK NPAS

Bond Air Services has handed over the first of an eventual seven upgraded Airbus Helicopters EC135 T2+ rotorcraft to the UK's National Police Air Service (NPAS).

Featuring a custom mission system including an L-3 Wescam MX-10 electro-optical/infrared camera, upgraded communications suite and new digital mapping featuring augmented reality, the modification work has been performed at Bond's Staverton facility in the west of England.

The initial example (G-POLB), handed over at Helitech, is a former Surrey-based police helicop-

ter that will now be operated from Boreham airfield in Essex.

Excess weight has also been stripped from the airframe, which along with an engine soft-



The first enhanced rotorcraft was handed over at Helitech

ware update has increased its useful load by 145kg (320lb).

With three crew on board and a full fuel load, it now boasts endurance of over 2h, says David Crisall, senior pilot at Boreham.

NPAS will eventually operate a total of seven Turbomeca Arrius 2B2-powered T2+ EC135s, alongside eight Pratt & Whitney Canada PW206-engined P2+ examples, all with a common mission system.

In addition, Bond will later this month place into service the first emergency medical services-rolled H135 in the UK (G-TVAL), operated on behalf of Thames Valley Air Ambulance. ■



ROTORCRAFT DOMINIC PERRY LONDON

Czech Republic guns for Mi-24 replacement deal

Bidders are lining up to respond to a nascent requirement to eventually replace the Czech Republic's air force fleet of Mil Mi-24 attack helicopters.

Prague's defence ministry issued a request for information in mid-June "to governments/manufacturers of multipurpose helicopters from Italy, the USA and France", and has received responses from "all three countries", it says.

The defence ministry plans to acquire an initial batch of 12 medium or intermediate-class rotorcraft for combat support tasks, it says. The type also will be required to perform troop transport and medical evacuation missions. AgustaWestland is offering the up to 6.8t AW139M, and has signed a memorandum of understanding



Gary Dawson/Rea Shutterstock

Prague wants new model to succeed its current 15-strong fleet

with local firm LOM Praha for the provision of in-country maintenance support.

Bell Helicopter is to pitch its 8.3t UH-1Y via the US Foreign Military Sales mechanism, with a US Marine Corps example having been displayed at a NATO event in Ostrava in late September.

No details have yet emerged from the other two likely bidders: Airbus Helicopters and Sikorsky.

Airbus Helicopters declines to comment, but is likely to propose either the 9t-class AS532 ALe or the 11t H225M Caracal. The latter has already been selected by Poland, in a deal which includes an

element of local assembly. Sikorsky is almost certain to bid with either US-built UH-60M or Polish-assembled S-70i Black Hawks. Slovakia in February announced plans to acquire UH-60Ms via a government-to-government sale.

The Czech defence ministry says its Mi-24 replacement process is "cautiously" scheduled for the 2016-2021 period. Bidders are anticipating a downselect decision in early 2016, with deliveries provisionally to start around 2017-2018. Armaments are included in the request, with industry sources indicating these will include unguided rockets, machine guns and air-to-surface missiles.

Flightglobal's Fleets Analyzer database records the Czech air force as having an active inventory of 15 Mi-24s. ■

UNMANNED SYSTEMS MURDO MORRISON VILLANOVA D'ALBENGA

HammerHead on track for new sale

Second European customer targeted by Piaggio Aerospace, as MPA derivative of P180 is readied for Dubai show debut

Piaggio Aerospace is committed to securing a second European customer for its P1HH HammerHead unmanned air vehicle by next July's Farnborough air show, following launch customer Italy's commitment earlier this year to purchase six aircraft and three ground stations.

"Our aim is to announce a second customer by then," says chief executive Carlo Logli, who identifies Germany, Portugal, Spain and Sweden as being among "the few countries that still have to make a decision on a MALE [medium-altitude, long-endurance UAV]".

Piaggio had to wait 18 months for a first order after unveiling the HammerHead at the 2013 Paris air show. However, Logli is convinced that once the UAV goes into service with Italy early next year, it will persuade other potential customers to commit.

"What we are missing is delivery," says Logli. "Until there is an aircraft flying, the market will be cautious. The UAV world is full of prototypes, but to take it to the next stage [certification and production] takes hundreds of millions of euros."

He adds: "Italy is a small order but of extreme importance as it is such a prestigious customer. They didn't buy it just because it was a national product. They believed in it from the beginning."

The P1HH, developed with Selex ES, is derived from the P180 Avanti business aircraft, which Piaggio has been producing since 1990. Sluggish sales of the eight-seat twin-pusher prompted the Genoa-based company, owned by Abu Dhabi investment fund Mubadala, to branch into the military and special missions market.

Logli maintains there are only



Piaggio Aerospace

Italy has ordered six of the Avanti-based surveillance aircraft

two competitors to the HammerHead on the market: General Atomics Aeronautical Systems' MQ-9 Reaper and the Israel Aerospace Industries Heron.

"This is a market that is exploding, but there is no one else serving it," he told *Flight International* during an interview at the company's Villanova D'Albenga production site. "We have two engines, a higher [operating] ceiling and can fly in any conditions. This makes me optimistic."

Piaggio is also completing the

development of its P180-based Multirole Patrol Aircraft (MPA) with Abu Dhabi Autonomous Systems Investments (ADASI). Piaggio aims to fly the aircraft by the end of this year, and to deliver two examples to ADASI in 2016.

The MPA has two additional fuel tanks in the rear of the cabin, as well as strengthened wings, canards and tail to double the P180's endurance to 8h. Programme participants include FLIR Systems, Saab and Telephonics, with Piaggio planning to debut a demonstrator at the Dubai air show. ■



BAE secures \$4bn F-15 systems deal
DEFENCE P24

PROCUREMENT BETH STEVENSON LONDON

Review underlines Norway F-35 plan

Stealthy type and Joint Strike Missile to form backbone of nation's military, with new surveillance aircraft also sought

Norway has used a strategic defence review to underline its commitment to acquiring 52 Lockheed Martin F-35s, and to outline plans to introduce new manned and unmanned surveillance aircraft and transport helicopters within the next 10 years.

"We remain dependent on the timely introduction of new capabilities into our armed forces, such as the F-35," defence chief Adm Haakon Bruun-Hanssen said on 1 October, describing the type as the "future backbone" of its military. "Only by completing the acquisition of 52 combat aircraft with the [Kongsberg] Joint Strike Missile will we be able to provide the full spectrum of capabilities that we need to address our future security challenges."

Lockheed on 23 September unveiled the first F-35A for the Royal Norwegian Air Force, with AM-1 to be based in the USA for train-



Torger Haugland/Royal Norwegian Air Force

Oslo is committed to acquiring 52 of the fighters over 10 years

ing. The service will have 28 aircraft operational by 2020, with the remainder to follow by 2024.

The review will help to inform a new long-term plan for the Norwegian armed forces, which should be released next year.

"My advice to the government is to strengthen our ability to conduct surveillance and intelligence, to improve the response times of our forces, and strengthen

the manning of key structural elements, while also improving our ability to protect key infrastructure," Bruun-Hanssen says.

Oslo plans to commence the phased retirement of its six Lockheed P-3C/N maritime patrol aircraft starting between 2017 and 2020, with the type to be completely removed from service in the 2021-2028 period.

"The P-3 Orion is a capable

structural element which provides important information, but the system requires significant updates, and for economic reasons cannot be given priority," the review says. Two almost 50-year-old Dassault Falcon 20s used for electronic warfare operations will also be replaced by 2024.

A combination of satellite-based sensors plus manned and unmanned surveillance assets will replace these types, the review says. Four new manned surveillance aircraft should be operational by 2024, along with six medium-altitude, long-endurance unmanned air vehicles and six tactical UAVs.

The review also confirms plans to acquire nine new rotorcraft to replace 18 Bell Helicopter 412s in supporting special forces operations by 2024. Likely candidates are the AgustaWestland AW101 and NH Industries NH90. ■

CONTEST BARTOSZ GLOWACKI WARSAW

Warsaw to start Kruk bidder dialogue

Poland's defence ministry will soon start technical dialogue with the four attack helicopter manufacturers pursuing its Project "Kruk" requirement to replace its Mil Mi-24 fleet.

In September, the nation's armament inspectorate sent an additional request for information, linked to technical data, to the contenders: Airbus Helicopters (Tiger), Bell Helicopter (AH-1Z), Boeing (AH-64E) and Turkish Aerospace Industries (T129).

Talks are planned to begin on 26 October, and will last for one week per company. The inspectorate should then determine the price and number of attack helicopters to be acquired.

Warsaw's initial plan was to acquire between 16 and 32 rotorcraft, to equip two squadrons. It could, however, consider buying an initial batch and including

others as options. Supporting documentation from the bidders should be ready by the end of March 2016, by which time the preferred tender process – potentially mandating the acquisition of helicopters via the US government's Foreign Military Sales mechanism – should be determined. An agreement should be signed with a bidder during the third or fourth quarters of 2017,

with deliveries to the Polish Land Forces' aviation command to start in 2019.

The armament inspectorate also revealed the price of the military's programme to acquire 50 Airbus Helicopters H225M Caracal multirole helicopters as just over PLN13.3 billion (\$3.5 billion). Some 40% of this sum will be for training and logistics support packages. ■



Bell Helicopter

Bell Helicopters' AH-1Z is among the types under consideration

ACQUISITION

Spanish MQ-9 purchase gets key approval

General Atomics Aeronautical Systems has received US State Department approval to sell four MQ-9 unmanned air systems to Spain. The total programme cost is estimated as \$243 million, including at least two years of contractor logistics support.

The Spanish air force selected the MQ-9 in August, following a competition also involving Israel Aerospace Industries' Heron TP. It plans to use the type mainly to conduct homeland security, counter-insurgency and counter-terrorism operations.

Equipment covered by the deal will include General Atomics Lynx synthetic aperture radars and Raytheon MTS-B multi-spectral targeting system sensors, but no weapons. A related offset agreement is being discussed. ■



CONTRACT STEPHEN TRIMBLE WASHINGTON DC

BAE secures \$4bn F-15 systems deal

Replacement electronic warfare suite to protect more than 400 US Air Force combat aircraft until retirement in 2040

BAE Systems will replace an ageing Northrop Grumman electronic warfare suite on more than 400 US Air Force F-15 combat aircraft. Boeing announced the decision on 1 October, with the programme worth around \$4 billion.

The selection continues BAE's sweep of recent electronic warfare contracts for F-15s, which began with Saudi Arabia's choice of the company's digital electronic warfare system for new-build F-15SAs, and the same equipment to retrofit its in-service F-15S fleet.

The USAF launched the Eagle Passive Active Warning Survivability System (EPAWSS) to replace the ALQ-135 tactical

electronic warfare suite on its fleet of F-15s.

Due to delays with the development and fielding of the Lockheed Martin F-35 Lightning II, the USAF has extended the service life of the F-15 fleet beyond 2040. It is upgrading the twin-engined fighter and ground-attack aircraft with new active electronically scanned array radars, electronic warfare sensors and processors, and replacement cockpit displays, which will present the new data to the pilot.

"EPAWSS will ensure the F-15 is relevant and dominant through 2040 and beyond," says Mike Gibbons, Boeing's vice-president of F-15 programmes.



US Air Force

Enhancements will be made to the service's 200 F-15C fighters

Boeing selected BAE over a bid from Northrop, which had offered technologies from the electronic attack pod upgrade programme for the Fairchild-Republic A-10 and Lockheed C-130.

BAE can draw on its experience in developing electronic warfare suites including the ALR-94 for the Lockheed F-22 and the ASQ-239 Barracuda for the F-35. Such systems allow fighter pilots to detect and engage or avoid hostile radar systems on the ground and in the air.

The EPAWSS includes an ability to detect and circumvent detection from infrared-based sensors, according to USAF budget documents.

Brian Walters, BAE's vice-president and general manager of electronic combat solutions, describes the selected system as "an executable, affordable and low-risk solution for the F-15 fleet".

Flightglobal's Fleets Analyzer database records the USAF as currently operating 200 F-15C fighters and 219 multi-role F-15Es. ■

UNMANNED SYSTEMS BETH STEVENSON LONDON

Ten-year support deal will enhance Global Hawk

Northrop Grumman has been awarded \$3.2 billion to support all variants of the US Air Force's RQ-4 Global Hawk unmanned air vehicle for 10 years.

Announced by the US Department of Defense, the arrangement covers the "development, modernisation, retrofit and sustainment of all of the USAF's

RQ-4s until 30 September 2025", including unspecified equipment to be ordered by September 2020.

The USAF has extended its planned retirement date for the Lockheed Martin U-2 surveillance aircraft from 2016 until 2019 to give it more time to upgrade the capabilities of its Global Hawks. It is unclear, however, which modernisation activities will be covered under the latest award.

Among proposed enhancements for the high-altitude, long-endurance UAV are the integration of a universal payload adaptor, which would enable the type to carry various sensors cur-

rently employed by the manned U-2. Northrop and the USAF signed a co-operative research and development agreement in July to demonstrate the modification, most likely using a United Technologies Aerospace Systems MS-177 multispectral sensor.

The USAF's Scientific Advisory Board has suggested the RQ-4 could in the future be upgraded with threat detection and countermeasures equipment, additional sensors and potentially also weapons. Northrop notes that sustainment costs for the Global Hawk have dropped by 40% over the last three years. ■



US Air Force

The RQ-4 will be able to carry similar sensors to the manned U-2

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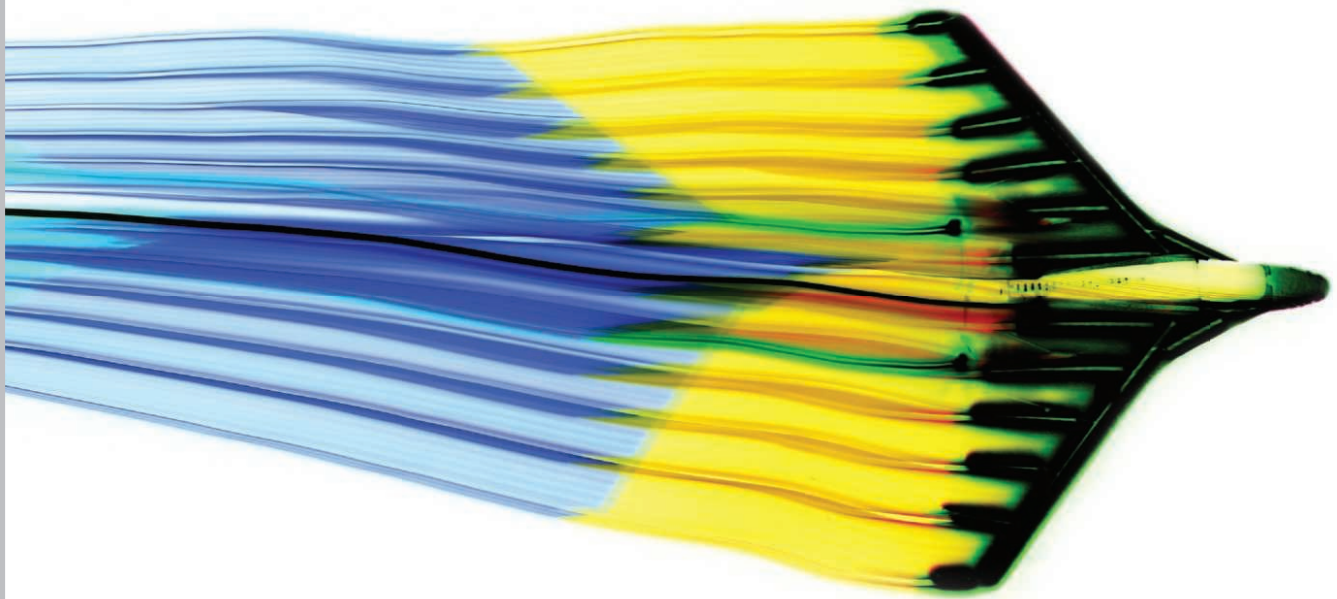
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AMPHIBIANS
STEPHEN TRIMBLE
WASHINGTON DC

AVIC launches Y-12 seaplane conversion

Chinese aircraft manufacturer AVIC has expanded into the seaplane market, ordering 100 sets of floats to convert 19-seat Harbin Y-12s into amphibious transports, says a US supplier. Seattle-based Kenmore Air said AVIC is acquiring Y-12 floats from its subsidiary EDO Floats.

The two-year conversion programme includes a plan to certificate seaplane capability with the US Federal Aviation Administration and Chinese civil aviation authority.

EDO designed the floats with carbonfibre material, says Kenmore Air, the largest seaplane operator in the USA. The deal creates competition for the de Havilland Canada DHC-6 Twin Otter and its Viking Air reincarnation, the Twin Otter Series 400.

With FAA certification, AVIC can market the aircraft beyond China. It plans to grow seaplane activity in China, from the south east coast to the Pearl River Delta and Yunnan province, says Kenmore Air. ■

CERTIFICATION KATE SARSFIELD LONDON

Evo landing gear validated

Magnaghi system has secured US and European approval for Avanti twin-turboprop

Piaggio Aerospace has secured European and US certification for the new landing gear on its Avanti Evo twin-engined turboprop, following an intensive flight-test programme.

The system, designed and manufactured by Italian company Magnaghi, replaces the Dowty landing gear that has been a feature on all Avanti models – including the first Evo, delivered in April to Greece's Superior Air – since Piaggio launched the P180 programme in the mid-1980s.

Piaggio says the Magnaghi system – which includes the main and nose landing gear, along with the nose wheel steering system – is more efficient than its predecessor. To illustrate this, it cites its 10,000-cycle/15-year overhaul interval, compared with the Dowty design's 6,000-cycle/12-year schedule.

"The new landing gear is now ready to be installed as standard on all the Avanti Evos to be delivered from now on," Piaggio says. It is planning to ship its next aircraft by late October or



In-service Evos will be offered a free anti-skid braking update

"early November at the latest". Up to a dozen Evos are scheduled for delivery by the end of next year.

The \$7.4 million Evo is the third iteration of the P180.

It was launched in May 2014 as an upgraded and higher performance version of the 10-year-old Avanti II.

As well as the new landing gear, the Evo also boasts a

revamped and quieter interior, winglets, redesigned engine nacelles, a reshaped front wing, five-blade composite scimitar propellers and anti-skid brakes. Designed and manufactured by Meggitt Aircraft Braking Systems, the latter feature is set for approval by year-end. Piaggio says in-service Evos will be offered a free retrofit, via a service centre bulletin. ■

PRODUCTION KATE SARSFIELD LONDON

Caravan on right Bering with 2,500th shipment

Cessna is preparing to deliver the 2,500th Caravan this quarter, to an Alaskan charter operator which was its original launch customer for the single-engined turboprop – Bering Air.

The Caravan EX rolled off Cessna's Wichita production line in Kansas in late September, a little over 30 years after the first iteration of the high-wing utility aircraft entered service with Bering. The Nome, northwest Alaska-based company operates eight Caravans for freight and passenger transport, serving the region's remote communities.

Bering embarked on a fleet renewal programme earlier this year to replace its older genera-



The Nome, Alaska-based company was the type's first customer

tion Caravans with the new EX. Launched in 2012, the aircraft features a Garmin G1000 glass cockpit and a more powerful and efficient Pratt & Whitney Canada PT6A-140 engine.

The Caravan is the largest single-engine aircraft produced by the Textron Aviation subsidiary. Assembled in Wichita and Shijiazhuang, China – through a joint venture with AVIC – the

fleet has notched up 13 million flight hours in a variety of missions, from owner operator and VIP charter to medical evacuation and surveillance.

Flightglobal's Fleets Analyzer database records 40% of the in-service Caravan fleet as being operated in North America, 19% in Latin America and the Caribbean, 17% in the Asia Pacific and 6% in Europe. Textron will be hoping to repeat the Caravan's success with its next single-engined turboprop, due in 2016. Little is known about the project, although the company has revealed it will be a clean-sheet design and not a derivative or variant of any existing product. ■



Fighting to win
in Asia
COUNTRY SPECIAL
P29

AIR TAXI KATE SARSFIELD LONDON

ImagineAir to grow its SR22 fleet via ownership scheme

Air taxi company planning to meet increasing demand through buy-and-lease-back strategy

US air taxi company ImagineAir is planning to double its Cirrus SR22 fleet over the next 12 months through the introduction of an ownership programme targeted at regular users of its on-demand service.

The Lawrenceville, Georgia-headquartered company is already the largest commercial operator of the four-seat piston-single, with 11 of the type in its line-up. It is hoping the new initiative – dubbed Platinum Membership – will boost the inventory to more than 20 by the end of 2016.

“Demand for our service is growing,” says ImagineAir co-founder and chief executive Ben Hamilton. The 10-year old company operates more than 5,000 flights per year, serving customers on the US East Coast. Hamilton attributes the growing appetite for its niche charter of-

“We now need to grow the fleet quickly in order to satisfy the growing demand”

BEN HAMILTON

Chief executive, ImagineAir



The four-seat piston-single is attractive to a niche charter market

fering to an increasing dissatisfaction with airline travel.

“Light aircraft like the SR22 provide a cost- and time-efficient alternative to regional airline travel,” he says.

Small types can also fly point-to-point, due to their ability to operate from hundreds of airports and aerodromes, he continues, so customers can avoid the congested airline hub-and-spoke system.

“We now need to grow the fleet quickly in order to satisfy the growing demand for our service. This latest strategy will help us to do that,” says Hamilton.

Platinum Membership is targeted at ImagineAir customers who fly at least two regional

trips per month. “They will purchase the SR22 [at a cost of \$677,000] from Cirrus and then lease it back to us for a four-year term,” says Hamilton.

The aircraft will be absorbed into the ImagineAir fleet and painted, at its expense, in the operator’s blue and white livery.

In exchange, these owners will receive more than \$200,000 of free, unlimited travel – equivalent to about 200 one-way flights. ImagineAir will also cover the crew, hangar, insurance and fuel costs, Hamilton says.

“Our Platinum members get a hassle-free, maintenance-free travel and ownership experience,” he adds. ■

GROWTH KATE SARSFIELD LONDON

Dassault Falcon boosts its heavy maintenance

Dassault will, on 16 October, break ground on a heavy maintenance, repair and overhaul (MRO) facility in Bordeaux-Mérignac, southwest France, to serve its expanding fleet of Falcon high-end business jets.

The 7,200m² (77,500ft²) building will be located next to the airframer’s Falcon final assembly hangar, and will accommodate up to six business jets at a time.

“The centre will allow Dassault Falcon Service to keep up with the growth in the Falcon fleet, already more than 2,000 aircraft worldwide,” says Dassault.

This will be the fourth company-owned service centre to offer heavy maintenance. The others are located in Le Bourget, France; Little Rock, Arkansas; and Wilmington, Delaware.

The new facility is scheduled to open in the third quarter of 2016, ahead of initial deliveries of the 8X ultra-long-range tri-jet, and planned ramp-up of scheduled heavy maintenance work – C-checks – on early 7X models. ■

INCIDENT KATE SARSFIELD LONDON

Fatal King Air crash inquiry

UK investigators are examining how a Beechcraft King Air 200 crashed after taking off from Stapleford airport in Essex on 3 October, killing its two crew.

The turboprop, G-BYCP, was owned and operated by the UK’s largest charter and management company, London Executive Aviation (LEA). According to the operator, the King Air 200 lifted off from its Stapleford base at around 10:20 local time. “Almost immediately after take-off, the aircraft came down in a field close to Stapleford airport,” says LEA.

The twin was one of the three King Air 200s in LEA’s 24-strong fleet. It was manufactured in 1981 and had its last maintenance inspection on 12 June. ■

FINANCE KATE SARSFIELD LONDON

Global Jet buys GE’s leasing portfolio

Fledgling business aircraft financing company Global Jet Capital is beefing up its portfolio of high-end jets with the acquisition of GE Capital Corporate Aircraft’s lease and loan business in the Americas.

The deal, which represents around \$2.5 billion of net assets, is scheduled for completion by the end of the year.

“We are investing heavily in expanding the business both organically and through strategic acqui-

sitions, such as this one with GE,” says Global Jet Capital’s executive director, Shawn Vick.

The Boca Raton, Florida-based company was launched a year ago by global investment firms GSO Capital Partners, the Carlyle Group and AE Industrial Partners, with the aim of providing finance and leasing options to owners of large-cabin and long-range business jets.

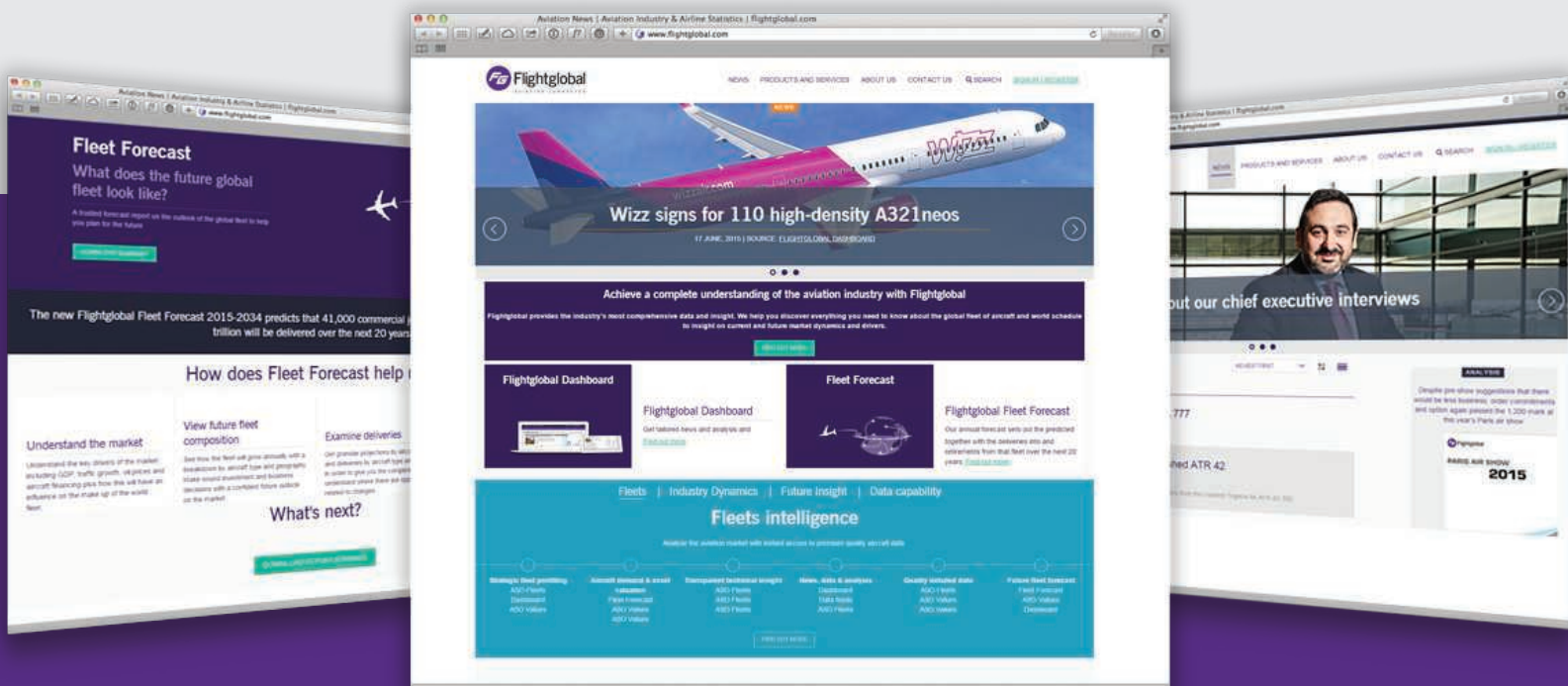
GE Capital’s portfolio of high-end corporate aircraft – which are

priced within the \$25-\$75 million range – will help to strengthen its foothold in this small, yet lucrative arm of the finance industry.

This niche sector is driven by wealthy individuals and corporations, which are turning to competitive financing solutions to fund their aircraft purchases rather than using their cash resources, says Vick, a business aircraft industry veteran and former senior executive with Gulfstream and Hawker Beechcraft. ■

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Korea Aerospace Industries

Korea Aerospace Industries' FA-50 has been an export success story

FIGHTING TO WIN IN ASIA

While domestic and international politics have so far thwarted South Korea's ambitious plans to develop a home-grown stealth fighter, the country's aerospace industry is proving to be a resilient competitor in the military and civil sectors. Report by Greg Waldron

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Korea Aerospace Industries



Greg Waldron/FlightGlobal

Politics has kept the ambitious KFX (top) stuck in the concept phase; Korean Air's MRO unit sees Boeing and Airbus types

DEVELOPMENT

KFX hits US tech buffer

Seoul's bid to supercharge its aerospace industry by designing a home-grown stealth fighter has been shot down – at least for now

Four years ago, at the 2011 instalment of the Seoul Air Show, South Korean officials predicted that 2013 would see the start of development for the country's long-planned indigenous KFX fighter aircraft. A first flight was likely in 2015, and full scale production in 2021. Seoul would have a 60% share in the project, while prospective partners Indonesia and Turkey would each have 20%. They would provide funds and a degree of participation, but there was no question that Seoul would sit in the cockpit.

The aircraft envisaged was ambitious, far more advanced than any aircraft developed in South Korea. It would vault the nation from a second tier player in the global aerospace supply chain to a leading systems integrator. Seoul's Defense Acquisition Programme Administration (DAPA) gave a long list of requirements: fly-by-wire flight controls, hands-on-throttle-and-stick pilot controls, a helmet-mounted display and a night vision imaging system. Low-observable technologies would reduce the jet's radar cross section (RCS). KFX would have an active electronically scanned array (AESA) radar and an infrared search and track (IRST) sensor.

As is all too common in the world of fighter development, things have not gone to plan. Turkey ended up not joining KFX, deciding instead to build its own indigenous fighter, the TFX. By the 2013 Seoul Air Show, officials were still in talks with various suppliers, but no prototype was on the drawing board.

"The benefits involve replacing ageing F-4 Phantoms and Northrop F-5s"

DANIEL DARLING

Analyst, Forecast International

Indeed, it was still some way from deciding whether Korea Aerospace Industries (KAI), the country's leading airframer, or KAL-ASD, a unit of Korean Air, would develop KFX.

Perhaps the single biggest element in the delays was Seoul's torturous F-X III fighter competition, the technology transfer offsets of which are earmarked for KFX work.



Contenders for the bitterly-fought F-X III deal included the Lockheed Martin F-35, Boeing's proposed F-15 Silent Eagle, and the Eurofighter Typhoon. Eurofighter was always deemed an outsider for the competition, but in a nod to KFX, it apparently offered an extremely lucrative technology transfer package.

In 2013, after a last minute scare from the F-15SE, the F-35 emerged as the winner of F-X III, although Seoul cut the airframe requirement from 60 to 40 examples, citing budgetary issues.

At the 2013 show, KAI had models of both single-engined and twin-engined KFX proposals. KAI's engineers favoured a single-engined jet as this would simplify production and keep costs down.

They also felt it would have better export potential, a crucial consideration for a successful programme. Seoul's Agency of Defense Development (ADD) disagreed. It preferred a twin-engined design resembling

the F-35, although not as capable as the US type. South Korea's air force also wanted two engines. Officers reckoned that the KFX will need to carry bigger, heavier missiles over its service life, and one day possibly accommodate power-hungry directed-energy weapons.

RE-TENDERING

Finally, in May 2015 it emerged that South Korea's DAPA had awarded KAI preferred bidder status for the programme, with Lockheed tapped as the foreign technical assistance company. KAI's success followed a forced re-tendering of the contract in February, when KAL-ASD (partnered with Airbus Defence & Space) apparently decided not to submit a bid.

"The benefits for South Korea from the KFX programme involve providing a modern replacement for the air force's fleet of ageing [McDonnell Douglas] F-4 Phantoms and Northrop F-5s," says Forecast International



The ambitious KFX fighter project has fallen foul of US government export rules

Korea Aerospace Industries

blocks – how much taxpayer-funded technology will foreign partners, namely Washington DC, be willing to part with?

KFX underlines the paradox inherent in defence offset arrangements. To win the business in developing nations, western defence contractors must assist programmes intended to create competitive products.

South Korean defence experts have long fretted about US willingness to part with sensitive technologies. Sources close to the programme say the biggest challenge is obtaining export licences from the US government related to AESA technology, engines, system

“KFX would help South Korean industry attain a new level of autonomy”

RICHARD ABOULAFIA
Analyst, Teal Group

integration and other areas. So prominent is this factor in their minds that they refer to it in shorthand as the “The E.L. issue”.

To get some sense about how prickly the USA can be about technology, it is useful to look at the KAI T-50 programme, in which Lockheed provided indispensable assistance. A source familiar with the T-50 says that Washington placed substantial restrictions on Jakarta’s acquisition of 16 T-50s, particularly around the aircraft’s radar and mission computer. In late 2014, South Korea’s Black Eagles display team, which flies the aerobatic T-50B variant of the trainer, cancelled its appearance at Airshow China in Zhuhai. It gave no reason for the cancellation, but media reports suggested that the USA was displeased that the aircraft, with its large amount of proprietary

American content, would attend a show in mainland China.

South Korean export licence fears were realised in late September 2015, when DAPA dropped a bomb.

TECHNOLOGIES DECLINED

It announced that the USA had declined to provide export licences for four technologies deemed fundamental to KFX: AESA radars,IRST, electro-optical target tracking devices and jammers.

The news created a furore in the South Korean media, with reports saying the country’s leadership will conduct an investigation into the programme. The reports suggest that DAPA failed to keep the nation’s leadership up to speed on progress with export licences.

A key theme in local media coverage of the issue is that technologies for the KFX programme were to have been derived from offsets related to the F-35 buy. Some question DAPA’s wisdom in selecting the F-35 when technology transfer was apparently not assured. In addition to the four “core” technologies that have been denied, 21 others have been approved by the US Department of Defense, but still await State Department approval. Although DAPA made no mention of »

KFX PROPOSED SPECIFICATIONS

Length	15.6m
Wingspan	10.7m
MTOW	24,500kg
Max speed	M1.9
Thrust*	40,000lb/178kN
Fuel capacity	5,400kg
Armaments	7,300kg
Systems	AESA radar,IRST sensor

*twin-engined SOURCE: Korea Aerospace Industries

analyst Daniel Darling. “[It is also intended to] add to local aerospace industry innovation and competency through knowhow gleaned from KAI teaming with Lockheed Martin on the aircraft’s development – and reducing what would otherwise be even more significant costs to the procurement portion of South Korea’s defence budget – by spreading the cost burden of the project, with 20% to be fronted by the KAI-Lockheed team, with another 20% by Indonesia.”

Teal Group analyst Richard Aboulafia agrees the KFX programme has the potential to advance South Korea’s aerospace sector.

“KFX would help South Korean industry achieve a new level of capability and autonomy,” he says. “If they designed it with the export market in mind, it would potentially establish South Korean industry as a player in the global defence market.”

KFX’s export potential, however, gets to one of the programme’s main stumbling



Austrian air force/Eurofighter

The Eurofighter Typhoon was always an outsider to land the F-X III fighter contract

» radar absorbent materials (RAM) in its September statement, this will be another area where KFX will face stiff headwinds.

In 2011, South Korean officials said they would deploy the aircraft in 2020 (a target that has long since been missed) with a “basic” stealth capability, although they declined to clarify what this meant. They contended that shaping an airframe to reduce its RCS is no great secret. All well and good, but it is unlikely that Seoul’s F-35 acquisition through the US Foreign Military Sales mechanism includes provisions for export licences related to the secret formulas used in RAM.

INDONESIAN ROLE

Meanwhile, through all the twists and turns around KFX, one constant has been Indonesia. There can be little doubt about Jakarta’s interest in KFX, with its defence ministry periodically issuing statements reaffirming its commitment to the programme.

Most recently, it announced the laying of the first brick of a KFX facility at the Indonesian Aerospace production centre in Bandung. Another apparent constant is the planned production run for KFX, which foresees 120 examples going to South Korea and 80 to Indonesia.

Unfortunately, however attractive Jakarta’s cash may be for developing KFX, the Southeast Asian nation is not the sort of partner Washington is likely to trust with sensitive technologies, let alone tightly guarded secrets such as RAM. Indeed, only in 2006 did Washington lift an arms embargo targeting Indonesia. Several South Korean sources blame Indonesia’s involvement in the programme for US reluctance to issue export licences. They claim that Jakarta is a lightweight in the global aerospace industry, and question how much value it can bring to the table. One expert says that jettisoning Indonesia would be a good way to placate Washington.

In an apparent bow to Washington’s likely concerns about Indonesian involvement, it is currently planned to provide Jakarta with jets in a Block I configuration. Block I would incorporate no stealth coatings – although it may employ some RCS shaping. It would include conformal fuel tanks, but no internal carriage of weapons.

Block II, which would go to the South Korean air force, would see conformal fuel tanks in addition to internal weapons carriage, as well as the possible introduction of stealth coatings.

If the Block I idea is not sufficient to satisfy Washington, another way to keep Indonesia in the programme and gain export licences could be developing two broadly different variants of the jet, the KFX and IFX. This proposal would see the latter produced with greatly reduced capabilities. This twin track

Indonesia’s presence in the KFX programme is thought to have alienated Washington



approach, however, would drive up costs and complexity. One expert says that the current export licence fiasco could perhaps lead to Seoul paring back its ambitions for the jet, and reverting to the single-engined design favoured by KAI.

Another major challenge for KFX – and an area where US help will be invaluable – is software. South Korean officials have said in the past that whereas the nation is capable of producing advanced sensors and systems, it has little experience with the sensor fusion that is crucial in giving the pilot an integrated

“The core technology transfer will be dependent on the US government’s export license”

KIM DAE YOUNG

Secretary general, Korea Defense & Security Forum

picture of the battle space. South Korea’s only indigenous combat aircraft, the FA-50 variant of the T-50, is an effective basic fighter, and sufficient to boost airframe numbers as F-5s and F-4s are retired, but it is a far, far cry from what is envisaged for KFX.

“Although South Korea acquired technology from developing KT-1 and T-50 to develop fighter jets, the nation is yet to possess core technologies,” says Kim Dae Young, secretary general of Korea Defense & Security Forum (KODEF), and a consultant to the South Korean government. “The core technology transfer will be highly dependent on the US government’s export license.”

Like other experts *Flight International*

spoke to for this article, he echoes the view that Jakarta’s involvement is probably an irritant for the USA. According to Kim, one back-up plan is to obtain core technologies from Europe. “The other issue is to figure out how much localisation will be required.”

RADAR DEBATE

In the case of the AESA radar, which is a core requirement for KFX, there are mixed opinions between the government and the aerospace industries about whether to develop an indigenous sensor, or to purchase it from abroad.

Kim adds that the programme is likely to cost around \$15 billion, making it the biggest procurement project in South Korea’s history. “As we’ve seen from several other countries’ next-generation fighter jet programmes, it is highly likely that the programme will go over budget. There is budget for KFX system development, but if the development programme does not go well, more budget will have to be invested. This will be a big burden for the next government administration.”

The KFX’s engines appear to have boiled down to two options in the 20,000lb thrust range: the General Electric F414 that powers the Boeing F/A-18E/F Super Hornet, and the Eurojet EJ200 that powers the Typhoon. Eurojet consortium company Rolls-Royce is leading the EJ200 KFX campaign. Becoming the KFX’s powerplant would be of tremendous benefit to both engine programmes, but industry experts say the GE engine has a clear edge. South Korea has long experience with American-built fighters and fighter engines. Local firm Samsung Techwin has produced a

number of GE engines under licence, such as the F100 for the Lockheed KF-16, F110 for the F-15K, and F404 for the T-50.

Of the pair, the GE engine also looks destined for a longer production run. Though its key platforms, the F/A-18E/F and EA-18G, are likely to exit production by the end of the decade, it has found a home on foreign types such as the Hindustan Aeronautics Tejas Mk II and the Saab Gripen NG.

“If we design and develop fighters at home, they can be optimised to our environment”

CHAE WOO-SEOK

Chairman, Korea Assoc. of Defense Industry Studies

“Based on the South Korea aerospace industry’s opinion, GE’s F414 is the strongest candidate in terms of capability and price,” says KODEF’s Kim. He notes that GE has more experience with indigenous programmes, including the T-50 and FA-50, which are powered by the F404.

“GE has also been building long-term relationships with South Korea’s aerospace industries and Hanhwa Techwin is producing various GE engine parts at the moment,” he adds. “Eurojet’s biggest weakness is that it only has experience in the Eurofighter programme. In addition, the F414 has a lot of field experience with F/A-18E/F. I believe ROKAF [the Republic of Korea Air Force] has more confidence with GE’s engine.”

One KFX-related field where DAPA appears keen to develop solutions with less input from foreign partners is weapons. South Korea’s ADD has worked with industry to produce a 226kg (500lb) guided weapon

called the Korea GPS-guided bomb (KGGB); an indigenous version of Boeing joint direct attack munition with a range-extending wing-kit. Footage from South Korean defence firm LIG Nex1 shows the weapon dropped from platforms including the FA-50, F-5 and F-15. Seoul has also expressed interest in developing air-to-air weapons for KFX.

Another area where Seoul has developed expertise is the internal carriage of weapons. In 2010, Boeing and KAI entered a memorandum of understanding for the latter company to design, develop and produce conformal weapons bays (CWB) for the F-15SE, runner up in F-X III. Although the Silent Eagle never emerged as a production variant of the F-15, in June 2012 Boeing said it had completed windtunnel tests for the type’s CWBs.

South Korea can bring these valuable technologies to the KFX programme, but far more will be needed for an effective, modern fighter. The KFX cannot escape the export licence issue. Despite Washington’s intransigence, there are hopes the US and South Korean governments will be able to sort their differences and move KFX forward. Indonesia is still integral to the programme, but if Seoul is forced to choose between Jakarta and Washington there can be little doubt where its loyalties lie.

Chae Woo-seok, chairman of the Korea Association of Defense Industry Studies, casts KFX as a natural progression for the nation’s aerospace industry: “The aerospace sector enhances our self-defence capability and lowers our dependence on foreign equipment.

“If we design and develop fighters at home, they can be optimised to our own environment. It will also be easy to operate and maintain in terms of logistics. Considering our current level of technology, it’s time to develop our own fighters.” ■



Korea Aerospace Industries

FA-50 version serves in attack role

EXPORT SALES

T-50 has T-X in its sights

Seoul’s jet trainer has won a string of overseas deals, but the big prize would be the US Air Force’s plan to replace hundreds of T-38s

In the 2012 South Korean film *Soar into the Sun*, a pilot of the country’s Black Eagles display team performs an impromptu air show above downtown Seoul in his Korea Aerospace Industries (KAI) T-50B Golden Eagle display aircraft.

An instant before crashing into the Seoul river, he fires the afterburner of his General Electric F404 engine, blasting up a plume of water and scattering office workers dining al fresco on the waterfront. The movie gets better, with Boeing F-15s and North Korean RAC MiG-29s battling while twisting and turning among the city’s buildings.

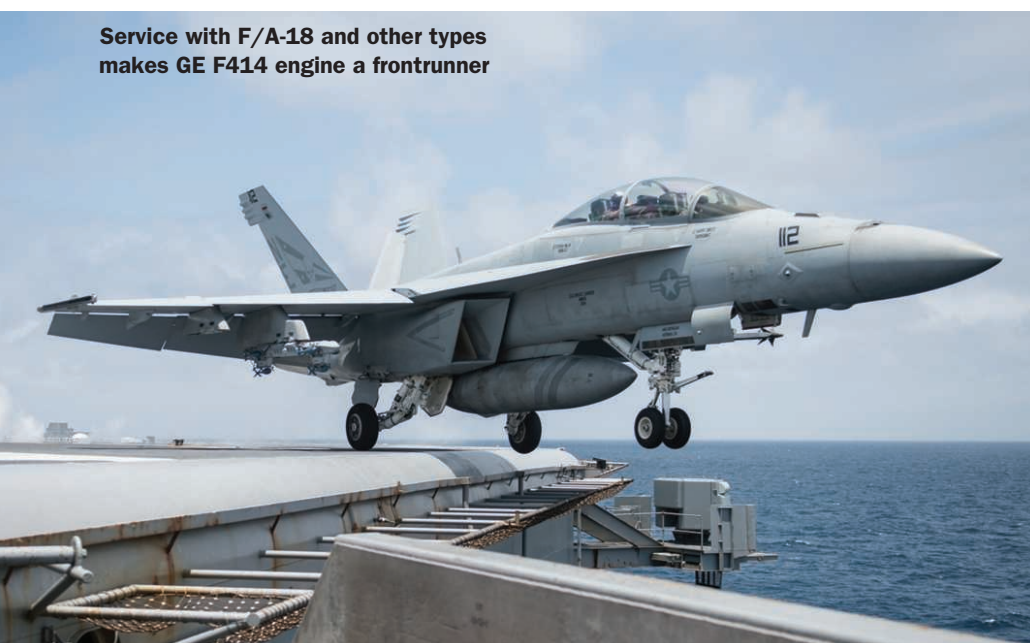
Although the T-50’s performance in the film (and the entire movie, for that matter) is high farce for anyone with even a passing knowledge of air forces and their equipment, the type’s respectable export performance in recent years shows that the aircraft is increasingly being taken seriously on the trainer scene worldwide.

EXPORT SUCCESS

KAI’s most recent success involved the sale of four T-50 trainers to Thailand for \$110 million, announced in September. According to KAI, the T-50 saw off rivals including China’s Hongdu L-15, the Alenia Aermacchi M-346 and Textron AirLand’s Scorpion. The South Korean government strongly supported the deal, adds KAI. The win brings its total sales in Southeast Asia to 32, following the sale of 12 FA-50s to the Philippines in 2014.

The company also secured an order from Iraq for 24 examples designated the T-50IQ in late 2013, with the first 12 to be delivered in early 2016. Indonesia, the first export customer for the type, has already received all 16 of

Service with F/A-18 and other types makes GE F414 engine a frontrunner



US Navy



Alenia Aermacchi's M-346 is a key rival

» the T/A-50s it ordered. Nonetheless, the T-50 has lost key trainer competitions, namely in Singapore and Israel, where it lost out to the M-346.

Meanwhile, the Republic of Korea Air Force has one operational squadron of FA-50s, with a second 20-aircraft squadron to be set up in early 2016, when the aircraft will receive its final operational clearance. It also has 49 T-50s, nine T-50Bs and 22 TA-50s.

Seoul's FA-50s are equipped with the Link 16 tactical data link, a mechanically scanned array radar, radar warning receiver and a night vision imaging system. They are capable of carrying 4,500kg (9,910lb) of guided weapons, have a 20mm cannon and can carry air-to-air missiles. All T-50 variants are powered by the General Electric F404 engine.

In the case of both the Philippines and Iraq, the type will play an important role in reconstituting the two nations' air forces, hence the value in buying an aircraft that can serve both as an advanced jet trainer and attack aircraft.

The Philippines deal is particularly pressing, as the nation finds itself in the unenviable position of needing to counter an increasingly assertive China in the South China Sea – having effectively left the fighter business when it retired its last Northrop F-5s over a decade ago. In 2011, a Philippine air force Rockwell OV-10 turboprop found itself unable to en-

gage what it reported as two Chinese fighters flying far overhead near to a reef claimed by Manila.

As for Iraq, sources close to the deal say that the T-50IQ is essentially an FA-50, although this has never been formally confirmed. The aircraft could prove a valuable resource in the Iraqi government's battle against Islamic State militants.

The real prize for the T-50 programme, however, is the US Air Force T-X competition to replace the venerable Northrop T-38 trainer. KAI estimates the value of this deal at \$10 billion, for about 350 aircraft, and plans to partner with Lockheed Martin in the competition. And, KAI adds, there will be demand from the US Navy and Marines for 350 advanced jet trainers, as well as 150 jets tailored to simulate enemy aircraft.

KAI reckons US trainer requirements could go as high as 1,000 aircraft. All this is contingent, however, on whether the USA decides to take a trainer off the shelf or go with a

“Should it come down to cost, it would appear the T-50 would be in a good position”

DANIEL DARLING

Analyst, Forecast International

clean-sheet design. A Boeing/Saab team and Northrop Grumman both plan to offer entirely new jets for the requirement.

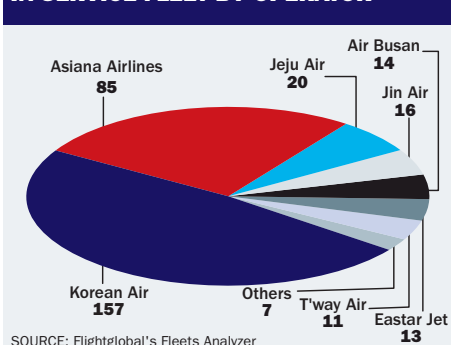
“Should the competition come down to cost, it would appear the T-50 would be in a good position to secure the contract,” says Forecast International analyst Daniel Darling.

“Naturally, if the clean-sheet design element overrides other concerns, then the T-50's prospects will dim. But as an advanced jet trainer that already has seen service use and derives part of its imprint from Lockheed Martin, the T-50 should definitely be considered a likely candidate.” ■

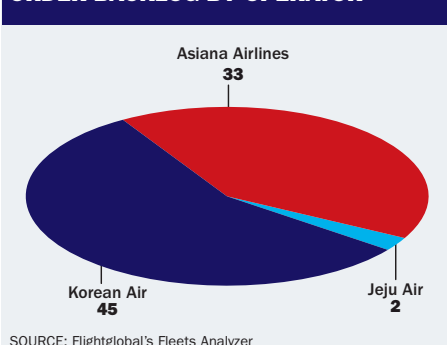


SOUTH KOREA'S CIVIL FLEET BY NUMBERS

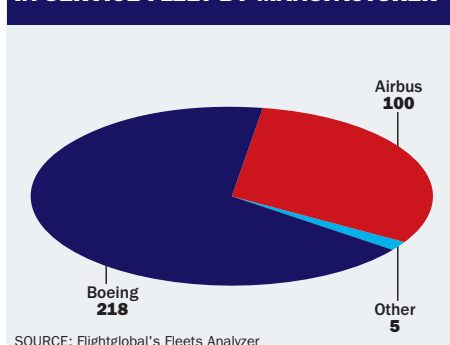
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IN-SERVICE FLEET BY MANUFACTURER

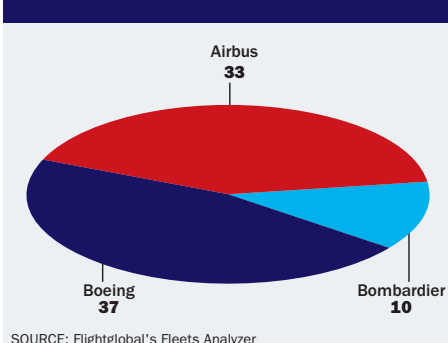


The T-50's external appearance belies its solid technical roots in development assistance from Lockheed Martin



Korea Aerospace Industries

ORDER BACKLOG BY MANUFACTURER



IN-SERVICE FLEET BY TYPE

Boeing 737NG	97
Boeing 777	55
Boeing 747	51
Airbus A330	44
Airbus A320 family	42
Airbus A380	14
Boeing 767	8
Other	12
TOTAL	323

SOURCE: Flightglobal's Fleets Analyzer

ORDER BACKLOG BY TYPE

Airbus A350	30
Boeing 777	12
Boeing 787	10
Bombardier CSeries	10
Boeing 747	9
Boeing 737NG	6
Airbus A380	2
Airbus A320 family	1
TOTAL	80

SOURCE: Flightglobal's Fleets Analyzer

THIRD-PARTY MAINTENANCE

Flag carrier goes global

For Korean Air's aerospace unit, a growing aerostructures business holds hope of a 'win-win' strategy in cost-focussed MRO market

The Korean Air Tech Center lies west of runway 16L at Busan's Gimhae International airport. A sprawling array of hangars, warehouses, and production facilities, it is home to the flag carrier's low profile aerospace division, KAL-ASD. It is here where the company performs the majority of its maintenance, repair and overhaul work, and where it also runs a successful aerostructures business.

"Places like Southeast Asia and China have lower labour costs that stand out in the global MRO market," explains KAL-ASD in an email to *Flight International*.

"Meanwhile," it continues, "Korean Air devotes strong efforts for achieving high customer satisfaction through high quality service and optimum turnaround time for specialised MRO operations, such as scheduled maintenance, repair and modification work, including passenger-to-freighter conversions, cabin modifications, IFE [in-flight entertainment] work, system upgrades and full exterior painting and stripping services."



The F-15 is among the types maintained by the Korean Air MRO division

KAL-ASD performs depot-level work on a variety of military aircraft



The aerospace division also performs heavy maintenance on the Boeing 747

Apart from Korean Air itself, KAL-ASD lists a number of airline clients, including United Airlines, Grandstar, World Airways, and Uzbekistan Airways.

It conducts heavy maintenance on 60 commercial aircraft every year and performs work on key Boeing types including the 737, 747 and 777, as well as the Airbus A330. Its components business also works on 25,000 pieces of equipment annually.

MILITARY ACTIVITY

In addition to commercial MRO, KAL-ASD is active with an array of military aircraft types operated by the South Korean and US air forces. KAL-ASD performs depot level maintenance for helicopters such as the Bell UH-1H and Boeing CH-47. Fixed-wing types in its portfolio include the McDonnell Douglas F-4 Phantom, Lockheed Martin C-130, F-16 and P-3C Orion, Boeing F-15, and Fairchild Republic A-10.

The business is also aiming to win work on newer programmes, such as the Bell Boeing MV-22 Osprey tiltrotor and the 747-8, which is in service with Korean Air. It also hopes to

obtain MRO work on the country's four 737-based airborne early warning and control system aircraft, as well as Seoul's future fleet of four Airbus Defence & Space A330 multirole tanker transports. Selected in June 2015, these are expected to enter operational service from 2019.

KAL-ASD is aware of the changes taking place in the industry, with the major airframers playing a more assertive role in after-sales support, eating into the business of independent MRO shops.

"Aircraft manufacturers will expand after-market service on customers' fleets and components with packages, and a slump in third-party MRO work in components is expected," says the company. "However, KAL-ASD's component MRO business will not be impacted in the near future.

"As aircraft manufacturers expand their component MRO businesses, competition will become more intense, then KAL-ASD will try to find a way to achieve a win-win situation."

KAL-ASD is active in aerostructures, with 27 active projects. It produces composite wingtip structures for types such as the 737 Max, 747-8, 777, 787 and the A320ceo/neo and A330neo.

It is especially active on the 787, providing raked wingtips, section 48 tailcone, flap support fairings, nose wheel well, aft wheel well bulkhead and stringers for section 11. It also provides cargo doors for the A350.

"KAL anticipates continuous growth in its aerostructures business. We are prepared to grow quickly by getting hold of the anticipated growth in demand and sales of aircraft," says the company. "KAL will put in effort developing advanced manufacturing technology to strengthen our cost competitiveness." ■

From yuckspeak to tales of yore, send your offcuts to murdo.morrison@flightglobal.com

Tracey traces Amy's path to Oz

Best of British to aviator Tracey Curtis-Taylor, who is now well on the way to Sydney after taking off from Farnborough on 1 October in her open-cockpit 1942 Boeing Stearman biplane.

Curtis-Taylor says her 12- to 14-week trip has been inspired by Amy Johnson's 1930 solo flight from Britain to Australia, and her route will follow Johnson's as closely as possible.

You can follow her travels on birdinabiplane.com as well as at @biplanebird on Twitter and on Facebook.

Emirates' Friend in high places

When you have the might of the USA's big three airlines lined up against you, Friends come in handy. Emirates has resorted to humour to take a none-too-subtle dig at its stateside rivals in its new TV advertisement, set on an airliner and starring the 1990s sitcom's Jennifer Aniston.

In the commercial, which airs in the USA this month, Aniston shows up in her dressing gown at the galley asking for the shower, to be greeted with guffaws from the mocking, workshy cabin crew members, who clearly work for an unidentified US airline.

Luckily, it is a nightmare, and Jen wakes up in her Emirates A380 first-class suite.

She is soon sitting at the bar, relating the story to the charming and attentive bar steward. Catch the advertisement on YouTube, although if you work for American, Delta or United, you might want to cover your eyes.



Aniston: life is suite on Emirates



Spirit of 1930: following in Johnson's pioneering wake

In too deep

Thanks to Brian Gittos for this spot from his local newspaper, which somewhat mars an exciting report on a Battle of Britain flypast by twice referring to a "Submarine Spitfire".

"Has local newspaper reporting sunk to new depths?" he asks.

Not bunny

We're intrigued by the name Airbus gives to an on-board sleeping pod in a new patent application: the Sky Hutch.

Our long-suffering air transport editor is unimpressed: "I'll sleep in a sky hutch when I turn into a sky rabbit."

Time to talk

We've all got so tied to our smartphones and email these days that it's hard to remember the time when you could go on a work trip and – save for emergencies – remain off radar.

That's why we loved the sign in a cafe, doing the rounds on Twitter, which says:

"No wi-fi. Talk to your friends. Call your mom. Pretend it's 1993".

Problem, Scotty?

Former Scottish first minister Alex Salmond caused a stir when he was banned from boarding a flight due to a discrepancy between his boarding pass and ID documents. He admitted, for security reasons, he often travels under a pseudonym. The name chosen: James T Kirk.

Moon-bust

"Dave Scott's Apollo 15 Lunar Surface-Worn Chronograph Watch to go under hammer", a press release informs us.

Won't that break it?



Anyone got the time please?

De-Lux the conflict

The Grand Ducal Government has sent a protest to the

100 YEARS AGO

Entente governments with regard to the recent aerial

attack on Luxemburg. The Luxemburg papers state that 16 bombs were dropped at Luxemburg during the air raid.

Galling for Nazis

The spirit of London and of all Britain remains unbroken.

75 YEARS AGO

Damage has been done, but very little makes any difference to our

war effort and none of it affects the great potential being built up overseas in the Dominions and the United States. That source of supply cannot be touched by the German bombers, and the mere thought of it must be gall and wormwood to the Nazi leaders.

Drink-flying ban

The FAA is proposing to make it an offence for any pilot to

50 YEARS AGO

operate an aircraft within eight hours of drinking alcoholic

beverages. Measurable blood alcohol has been found during several autopsies performed on general-aviation pilots killed in flying accidents.

Iraqi Scud fear

Iraq is developing a fuel-air explosive warhead for its

25 YEARS AGO

Scud, Al Hussein and Al Abbas short-range ballistic missiles.

Sources say Iraq acquired the technology... in the defunct Condor missile project with Argentina and Egypt.



100-YEAR ARCHIVE

Every issue of *Flight* from 1909 onwards

can be viewed online at flightglobal.com/archive

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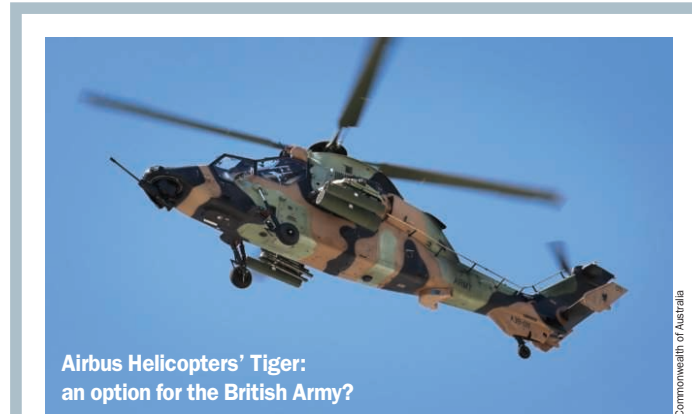
Pilots vulnerable to flight pressure

Chris Skillern is making judgements about the events surrounding the Aeromexico Boeing 767-200 tailstrike (*Flight International*, 6-12 October), based on 5% of the facts.

These types of incidents keep happening and they happen because of systemic issues of which the final gotcha is a pilot error, often created by distracted or busy flight crew with an interrupted departure briefing.

This might be because of bad weather outside, marital issues, someone sick at home, a death in the family, depression, a broken aircraft, slot issues or running out of flight duty period, management dictates and bullying and the worst one of all – being flat exhausted after too many earlies, lates, and crossed time zones. These issues might be ably assisted by having a co-pilot who has almost no experience.

They are the inevitable features of life on the flightdeck. To have a chance of curing these systemic issues, we need a culture where errors are reported and the underlying causes tack-



PROCUREMENT

UK could follow Australia's lead

The British Army could consider the Airbus Helicopters Tiger HAD as a replacement for its Apaches (*Flight International*, 8-14 September) – the Australian army has.

It looks doubtful that the Royal Air Force will get any Lockheed Martin F-35Bs, or As, for that matter. It might be better to consider extending the lives of its Panavia Tornado GR4s, just as the Luftwaffe is doing, and the Saab Gripen E surely is an option?

The scrapping of the new Nimrods five years ago saw the loss of billions of pounds. As for the purchase of 50-year-old Boeing tankers for Rivet Joint aircraft – did nobody consider metal fatigue?

It would be better to consider Airbus A330s for outfitting by BAE Systems to the maritime role.

Albert Gorton

Harpole, Northampton, UK

led systematically. This will not happen if pilots are fired for every error.

The only time a pilot should be fired for a lapse, is when he fails to report a serious incident or near accident, or his behaviour is wilfully negligent – like consistently and deliberately ignoring company standard operating procedures (SOP) or colleagues' concerns. We don't know if it happened in this case.

Maybe Chris is that one person who has never forgotten to do something, and then wondered how they did that. For the rest of us, mistakes happen. They are normally caught by the flight deck teamwork, SOPs and check-

lists. Inevitably some of them will slip through and an accident or incident is the result. What is disturbing about many such incidents, is that the biggest cause – fatigue – is never uncovered in the subsequent accident report, so such an endemic issue is left untackled.

Name and address withheld

A Riveting name

Let's give the RC-135 a proper name, or has it got one already?

Paul Burch

Farnham, Surrey, UK

Editor's reply:

'Rivet Joint' seems to work just fine for the US Air Force

A battle for the number one spot

I was mulling through your end-of-year analysis of the Top 100 aerospace companies (*Flight International*, 15-21 September), and, as expected, Boeing is number one and Airbus number two. While this must bring a certain amount of satisfaction to Boeing, it is not quite what it anticipated in the early days.

Boeing's plan was to eliminate all domestic competition. In 1997, with the 747 as a bludgeon, it finally took over McDonnell Douglas, the only major competitor left at the time.

Crossing the Pond, it noticed a deterioration in top management decisions in British industry.

The collapse of car and motorcycle production seemed to have affected the British airframe industry, despite the fact it had the skills and capacity to be a proper competitor to Boeing with the BAC 1-11 and Vickers VC-10.

BAC's failure to offer a plug for the 1-11, however, had allowed Douglas to catch up and surpass the programme with its DC-9.

It looked like 'plane sailing' for Boeing until Europe's industry woke up to the peril of having no capacity to take it on.

Airbus finally rolled-out the A300 (in 1972).

From that hesitant start came a whole range that is now competitive with Boeing, including the A380 which looked the 747 right in the eye. The long-delay in getting the 787 into production enabled the A350 to become an alternative choice. This was a stroke of luck for Airbus, and I doubt Boeing will give them another chance like that.

It's going to be a good, solid battle from now on.

WD Barbut

London, UK

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information



EVENTS

8-12 November

Dubai Air Show
Dubai World Central
dubaiairshow.aero



12 November

Ascend West Coast: Finance
San Francisco, USA
flightglobalevents.com/
ascendwestcoast15

15-17 November

ALTA Airline Leaders Forum
San Juan, Puerto Rico
alta.aero/airlineleaders/2015

17-19 November

NBAA 2015
Las Vegas, USA
nbaa.org/events/bace/2015

17-19 November

Aerospace & Defense Meetings Torino
bciaerospace.com/turin

19-20 November

Safety In African Aviation
Kigali, Rwanda
2gether4safety.org

30 November - 2 December

Expodefensa
Bogota, Colombia
expodefensa.com.co

1-2 December

Military Airlift & Rapid Reaction Ops
Seville, Spain
smi-online.co.uk/defence/europe

8-10 December

Aerospace Meetings Brazil
Sao Paulo, Brazil
bciaerospace.com/brazil

21-23 January 2016

Bahrain International Airshow
Bahrain
bahraininternationalairshow.com

3-4 February 2016

Aircraft Interiors Middle East
Dubai World Trade Centre, UAE
aime.aero/welcome-to-aime-2016

16-21 February 2016

Singapore Air Show
Changi Exhibition Centre, Singapore
singaporeairshow.com

17-19 February 2016

Routes Americas
Puerto Rico
routesonline.com/events/178/
routes-americas-2016

6-8 March 2016

Routes Asia
Manila, Philippines
routesonline.com/events/180/
routes-asia-2016

26 March - 3 April 2016

FIDAE
Santiago, Chile
fidae.cl/en

5-7 April 2016

Aircraft Interiors
Hamburg, Germany
aircraftinteriorsexpo.com

18-21 April 2016

Defence Services Asia
Putra World Trade Centre, Kuala Lumpur
dsaexhibition.com



For a full list of events see
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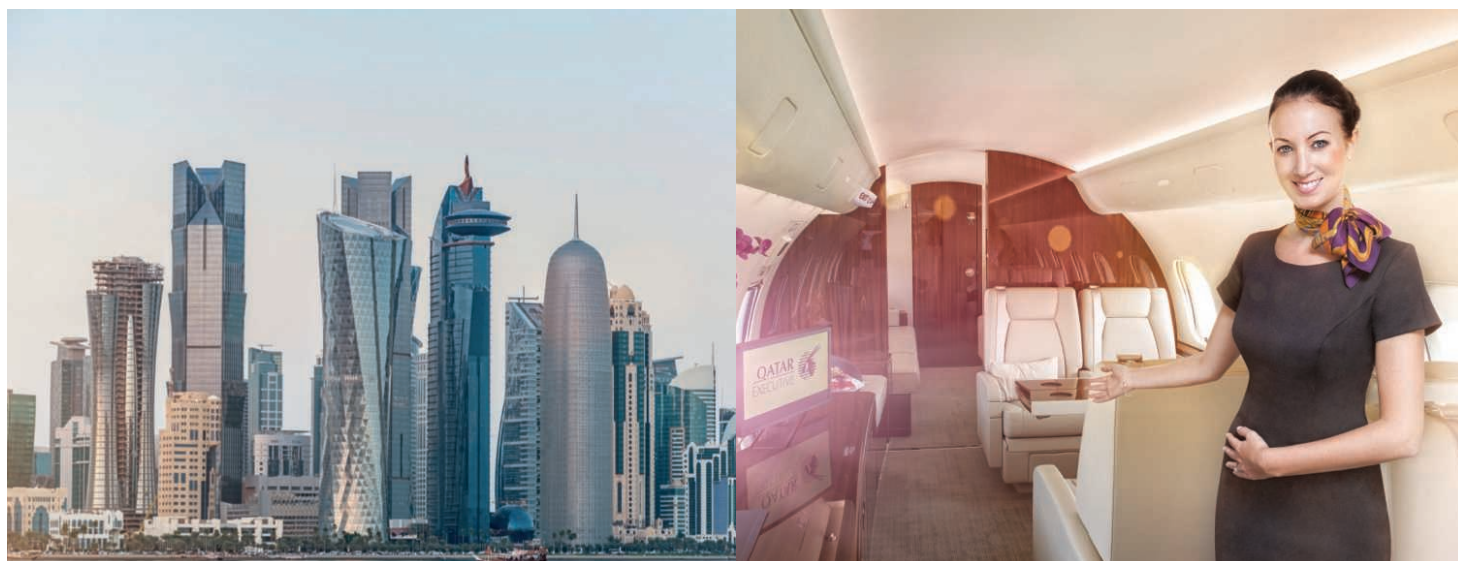
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WORK EXPERIENCE SASKIA DE JONG

A career match made in heaven

When Ritz Carlton manager-in-training Saskia de Jong was offered the chance to join online charter marketplace Avinode, the chance to marry a love of travel with luxury accommodation experience was too good to pass up

What are your qualifications?

I have a bachelor's degree in business administration from the Hotel Management School Maastricht, in the Netherlands.

Of course, the real requirements of the business aviation industry extend far beyond qualifications on paper.

Every day, I need to be a relationship-builder and a problem-solver as well as understanding the technology involved in the aviation charter industry.

Why did you decide to pursue a career in aviation?

I have always had a passion for travel and used to work in the high-end service industry.

I started my post-college career with the Ritz Carlton in its manager-in-training programme. Its mission is to provide genuine care and exceptional products and services, something that always stuck with me.

When I was given the opportunity to work for Avinode – a young innovative Swedish company specialising in the online business aircraft charter marketplace, it was the perfect synergy for me. An opportunity that was, therefore, too good to miss.

Tell us about your typical day

No day is typical of course, but I'd say I spend about a quarter of my time each year travelling to visit our members.

It's very important to listen to their feedback and understand their needs, which can change, so we can raise our service to an even higher level. I'm commit-



De Jong is eager to help streamline the processes used in her industry

ted to meeting all levels of staff among our key accounts.

C-suite executives are obviously important but I also need to understand the feelings and requirements of our day-to-day service users at any level.

When I am back in the office, I share my findings with my colleagues. We discuss everything, from product development such as mobile apps and APIs [application programming interfaces] and support, through to management resources to best meet our members' expectations.

"I'd say that I spend about a quarter of my time each year travelling to visit our members"

I need to make sure that I'm aware of how industry trends, and any other relevant intelligence, might impact on our business and our relationships with our members.

What do you enjoy most about your job?

I love the challenge, and reward, of finding just the right service for our members.

If I hear a member has won several trips in the first few weeks of signing up with Avinode, that's awesome news.

The least?

The Avinode development team works incredibly hard to develop new technology to meet changing market demands.

While our team is outstanding, nobody can produce miracles overnight, and sometimes I'm impatient for miracles to happen.

How do you develop new contacts?

I have three main approaches to developing contacts: face-to-face meetings when I am travelling, talking to people at trade shows, and through social media sites, particularly LinkedIn.

Where do you see yourself in five years?

I enjoy working in business aviation and there is still so much potential to streamline processes in our industry.

I would love to be a part of that particular development. ■



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